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REPORT ON WATER POLLUTION CONTROL - NORTHWESTERN LAHONTAN BASIN, GREAT BASIN DRAINAGE BASIN

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San Francisco, California

April 1953

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Report on Water Pollution Control

NORTHWESTERN LAHONTAN BASIN
Great Basin Drainage Basin

Prepared by:

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service
Division of Water Pollution Control
Pacific Southwest Drainage Basins Office

in cooperation with

NEVADA
State Department of Health
Division of Public Health
Engineering

CALIFORNIA
Lahontan Regional Water
Pollution Control Board
State Water Pollution Control
Board

April 1953

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108

TABLE OF CONTENTS

Page

Introduction 1

Acknowledgments 3

Comprehensive Program for Control of Water Pollution Northwestern Lahontan Basin 5

Map No. 1 - General Reference Map 7

Map of Lake Tahoe Watershed 11

General Description Northwestern Lahontan Basin 17

  Historical Background 17

  Topography 18

  Geology 18

  Climate 19

  Hydrology 20

  Economic Development 23

Use of Water Resources 25

Map No. 2 - Existing Primary Water Uses 27

Water Quality Objectives 34

Pollution Contributed to Watershed 43

Map No. 3 - Sources of Municipal and Industrial Wastes and Existing Treatment Facilities 45

Damages to Water Resources from Pollution 48

Benefits Resulting from Pollution Prevention and Abatement. . 51

Pollution Prevention Measures in Effect 53

Pollution Prevention Objectives 64

TABLE OF CONTENTS

Page

Map No. 4 - Municipal and Industrial Waste Treatment Needs 75

Bibliography 78

Appendixes

INTRODUCTION

This cooperative State-Federal report for the Northwestern Lahontan Basin and the comprehensive plan it contains for the control of water pollution in the Basin were developed by the California and Nevada water pollution control agencies and the Public Health Service in keeping with the provisions of State and Federal legislation. The legislative basis for this joint undertaking should be of interest and is here briefly summarized.

Nevada Statutes of 1949, Chapter 227, designate the State Board of Health as the State water pollution control agency. The statute authorizes the Board to cooperate with the Surgeon General, other agencies of the Federal government, with other State and interstate agencies, and with other interested parties in all matters relating to water pollution, including the development of programs for eliminating or reducing pollution and improving the sanitary condition of surface and underground waters.

In California, legislation adopted in 1949 vests equitable control of the use of water for waste disposal in proper relation to all other uses in nine Regional Water Pollution Control Boards, and in the State Water Pollution Control Board. These Boards have the duty of coordinating the action of the numerous governmental agencies involved and promoting cooperative action with the waste producing industries. The Boards are empowered to make and enforce rulings as to conditions to be maintained in all instances of pollution and nuisance, and may obtain technical assistance from any State or local agency. For the purposes of Public Law 845, the State Water Pollution Control Board is designated as the State water pollution control agency.

The Federal Water Pollution Control Act, Public Law 845, enacted by the 80th Congress in June 1948, requires the Surgeon General of the Public Health Service to cooperate with other Federal agencies, with State and interstate water pollution control agencies and with municipalities and industries in the preparation or adoption of comprehensive programs for eliminating or reducing the pollution of interstate waters and tributaries thereof, and improving the sanitary conditions of surface and underground waters. In developing these comprehensive programs for water pollution control, due regard must be given to the improvements necessary to conserve the nation's waters for public water supplies, propagation of fish and aquatic life, recreational purposes, and agricultural, industrial, and other legitimate uses.

The data on which this report on the Northwestern Lahontan Basin is based were assembled by the Lahontan Regional Water Pollution Control Board, the Division of Public Health Engineering, Nevada State Department of Health, and the Pacific Southwest Drainage Basins Office, Public Health Service. It is based upon data current as of April 1953.

These data, including information obtained from field studies, were used to prepare a comprehensive plan for control of water pollution. This plan was then reviewed by all Nevada and California State agencies, and Federal agencies which have an interest in water resources. A sincere effort was made by all who contributed to this report to present an accurate picture of the water pollution problems and to develop a cooperative water pollution control program for safeguarding the water resources of the Northwestern Lahontan Basin.

ACKNOWLEDGMENTS

Appreciation is expressed to the State and Federal Agencies which furnished much of the information upon which this report is based. These agencies include:

CALIFORNIA AGENCIES

- Department of Natural Resources
  - Division of Forestry
- Department of Fish and Game
- Department of Public Health
- Department of Public Works
  - Division of Water Resources.

NEVADA AGENCIES

- Department of Agriculture
  - Agriculture Experiment Station
- Divisions of the Department of Health
- Fish and Game Commission
- Highway Department
- Office of the State Engineer

OREGON STATE SANITARY AUTHORITY

FEDERAL AGENCIES

- Department of the Army
  - Corps of Engineers

- Federal Power Commission

- United States Department of Agriculture
  - Agriculture Extension Service
  - Bureau of Land Management
  - Forest Service
  - Soil Conservation Service

- United States Department of Commerce
  - Bureau of Census
  - Weather Bureau

- United States Department of the Interior
  - Bureau of Reclamation
  - Fish and Wildlife Service
  - Geological Survey
  - Office of Indian Affairs

COMPREHENSIVE PROGRAM FOR CONTROL OF WATER POLLUTION
NORTHWESTERN LAHONTAN BASIN

General Characteristics of Basin

The Northwestern Lahontan Basin occupies about 35,000 square miles in northwestern Nevada and northeastern California (82% in Nevada, 17% in California, and 1% in Oregon). The topography of the region is varied and includes mountains, deep canyons, fertile valleys, and barren deserts. Fertile alluvial soils predominate at the base of the mountains, near streams, and in the upper valleys of the Carson and Walker Rivers. The poorly drained sink areas contain high concentrations of soluble salts and hence are not suitable for agriculture.

The principal streams--the Truckee, Carson, Walker, and Susan--head in the Sierra Nevadas and flow in a general north to east direction, except the Susan which flows east to south, to their respective termini in sinks or lakes. The first three streams are interstate whereas the Susan River is entirely within California. These several river systems are completely independent of one another although the Truckee and Carson Rivers are connected by the Truckee Canal. This canal diverts water from the Truckee River to the Lahontan Reservoir on the Carson River for ultimate use in the Newlands Irrigation Project.

Flow in these streams, derived principally from snow melt in the mountains, varies widely with one-half to three-fourths of the total run-off occurring during April, May, and June. As a consequence of this heavy spring run-off, there are prolonged periods of very low flows during the late summer and fall (Appendix - Table 5). These low flows are the critical factor in determining the amount of dilution water in a stream, and hence to a large degree govern the sewage treatment requirements.

Several reservoirs have been constructed to store spring run-off for irrigation; however, the capacities of these storage reservoirs are not sufficient to permit full regulation of the streams.

Development and use of underground water supplies is confined to a few small areas, and in none of these is the development complete.

The basin has a great variety of mineral resources the most important of which are copper, gypsum, lead, gold, and silver. In recent years, most of the mining activity has been of relatively small scale; however, the Anaconda Copper Company is constructing a large plant for extracting copper from extensive deposits of low grade ore at Yerington, Nevada.

Geographic variations in precipitation, caused by elevation and exposure to moisture bearing winds, range from over 45 inches at Soda Springs, California, to three inches at Thorne, Nevada, with most of the basin receiving from 10 to 20 inches. Most of the precipitation occurs during the winter, and a maximum of 225 inches of snow has been recorded at Marlette Lake with snow packs of over 100 inches common in the Sierra Nevada.

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Over most of the basin there is a wide seasonal and diurnal temperature range. The extremes vary from -28°F at Soda Springs to 110°F at Lahontan, Nevada. Relative humidity is low; for example, Carson City has a 5 a.m. average of 63% and a 5 p.m. average of 37%. Evaporation rates exceed 40 inches per year over most of the basin. The length of the growing season, related directly to elevation, varies from 59 days at Truckee, California, to 168 days at Thorne, Nevada.

Economic Development

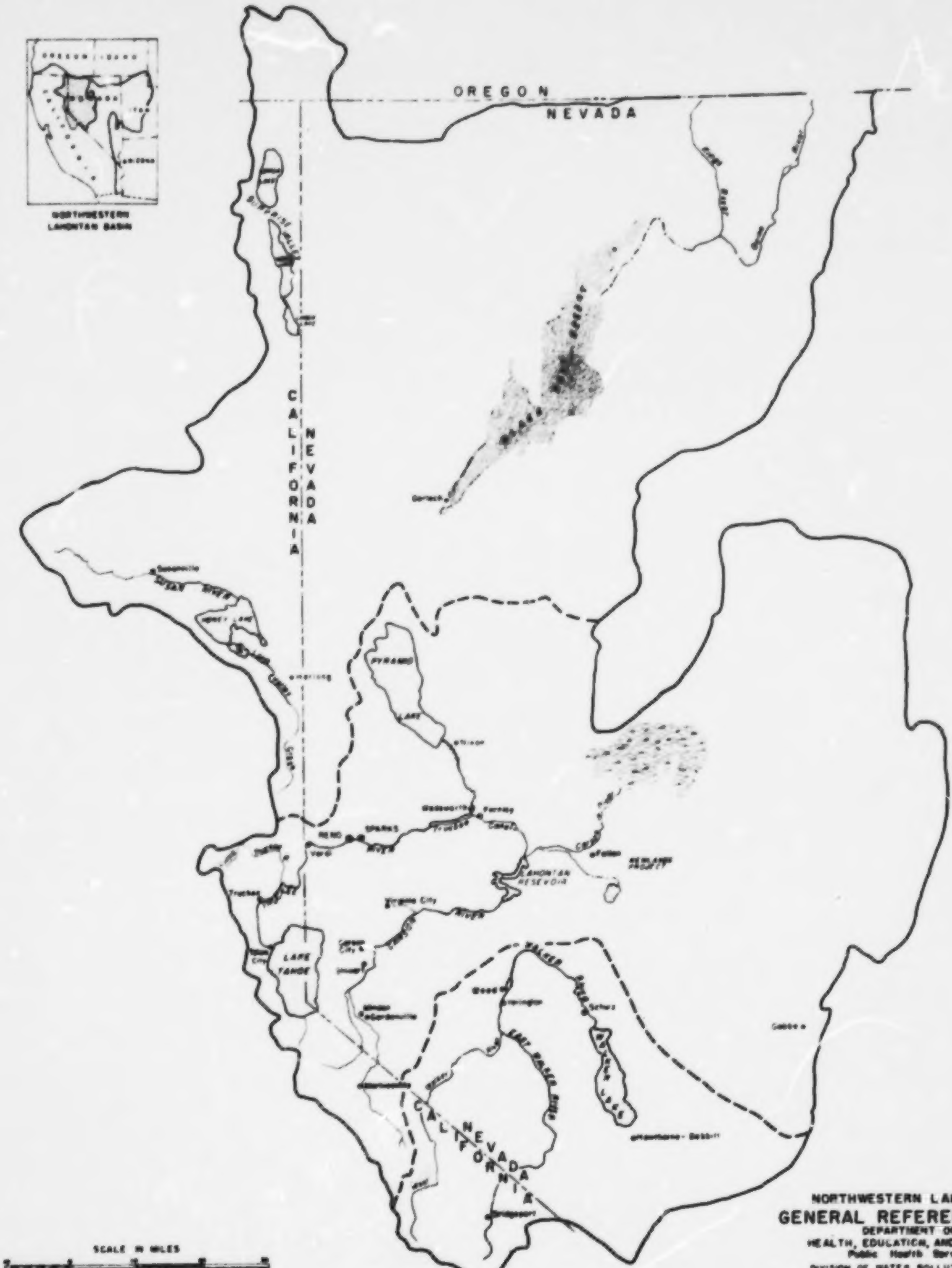
In 1950 the total population of the basin was approximately 92,000, over half of which was in the Reno-Sparks, Nevada, area. During the past 30 years there has been a distinct trend toward urbanization--over 90% of the growth occurring in the urban areas. Important population centers include Reno-Sparks, Hawthorne-Babbit, Fallon, Yerrington, Carson City, and Minden-Gardnerville, in Nevada, and Truckee, Tahoe City, Susanville, Bridgeport and Markleeville in California. Also, the Lake Tahoe area in both California and Nevada.

The economy of the basin is founded upon recreation, irrigated agriculture, livestock raising, and to a lesser extent, mining and logging. Manufacturing is of minor importance.

Recreation and tourist activities are of primary importance to the local economy. The Tahoe country is nationally known for its seasonal resorts and tourist accommodations, and the lake is rimmed by summer cabins and resorts. It is estimated that the summer population of the Lake Tahoe area is about 50,000, and that a total population of 200,000 may ultimately be reached. Other mountainous portions of the basin have not been as highly developed as the Lake Tahoe region; however, it seems only a matter of time until similar development will occur. Legalized gambling in Nevada attracts many visitors--three million tourists per year pass through Reno.

Fishing is a very popular sport on the streams and lakes. The California Fish and Game Commission has estimated that 60,000 to 75,000 anglers visit the California portion of the Truckee watershed annually and that the annual value of this sport fishing approaches $1,000,000. Fishing use of the less readily accessible streams is, of course, lower, but is still an important consideration in determining beneficial water use. Hunting for deer and waterfowl are also popular sports. The sinks of the rivers are excellent waterfowl habitats, and one, the Carson Sink, is the most important waterfowl refuge in the entire Lahontan Basin.

Agriculture, although limited by the amount of water available, is one of the most important sources of income. Nearly 400,000 acres are irrigated from the principal river systems and in addition there is a considerable acreage irrigated from the smaller streams. A large percentage of the irrigated land is used for production of alfalfa and wild hay for the winter feeding of livestock, with only a small percentage used for production of cereal crops and vegetables. The income from agricultural products in 1950 was estimated at over 18 million dollars, about 80% of which was from the sale of livestock or livestock products--principally beef cattle, wool, and sheep.


OREGON
NEVADA
CALIFORNIA
NEVADA
NORTHWESTERN LAHONTAN BASIN
Gerlach
Susanville
Honey Lake
PYRAMID LAKE
RENO
SPARKS
Verdi
Truckee River
Wadsworth
Fernley
Canal
LAHONTAN RESEVOIR
Fallon
NEWLANDS PROJECT
Virginia City
Carson River
Carson City
Truckee
LAKE TAHOE
Minden
Gardnerville
Walker River
Yerington
Schurz
Walker Lake
East Walker River
Hawthorne-Babbitt
Gabbs
Bridgeport
CALIFORNIA
NEVADA
SCALE IN MILES

NORTHWESTERN LAHONTAN
GENERAL REFERENCE MAP
DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE
Public Health Service
DIVISION OF WATER POLLUTION CONTROL
MAP NO. 1

GPO 966684

Logging and related activities, relatively unimportant in Nevada, are of prime importance in the California counties. Most of the timber comes from the six National Forests--Modoc, Toiyabe, Lassen, Plumas, Tahoe and El Dorado--that are wholly or partially within the basin. Included within the boundaries of these forests is much of the valuable mountain watershed.

Mineral production is estimated at over two million dollars annually. Production of copper from the new plant at Yerington will increase this figure considerably.

Sources of Pollutants

Polluting materials originate from four separate sources: (1) municipal sewage, (2) industrial waste, (3) recreational use of the water, and (4) soil erosion. The sources and quantities of pollutants from these several sources are discussed below:

There are 24 sewered communities in the basin having a total population of approximately 72,000. The population equivalent of the wastes from these communities is decreased by treatment to 42,000, 53%* of which is discharged to the Truckee River, 5% to the Carson River, none to the Walker River, one percent to the Susan River, and about 40% to land disposal areas.

Cesspools or septic tanks are used for disposal of sewage at many of the smaller towns and in the unsewered recreational areas. In several of these localities the individual disposal systems occasionally allow sewage to overflow thus causing health hazards and nuisance conditions. At Verdi, Nevada, individual sewage disposal systems have caused dangerous contamination of the ground water.

Defilement of the streams and lakes by the many campers, fishermen, and hunters who visit this area is a problem. In the regulated camp grounds, sanitary facilities are usually provided. However, along the river banks, and away from the established camps it is the sole responsibility of the individual to protect the streams from contamination--and all too frequently the individual shirks this responsibility.

A closely related problem is that of disposal of wastes directly into the lake from the four or five boats on the lake having flush-type toilets. In areas such as Lake Tahoe where untreated lake water is extensively used** as a potable water supply there is a potential disease hazard from this practice.

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* 96% of this is from Reno-Sparks (Nevada).
** 56,490 consumer months in 1948 at Lake Tahoe.

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Industrial pollution is currently limited to wastes from a gravel washing plant near Reno, occasional discharges of cyanide wastes from the mills in the vicinity of Virginia City, and the possible discharge of water from log ponds.

Soil erosion is a major source of suspended sediment in surface waters in some portions of the basin. Several factors--indiscriminate logging during the Comstock era, uncontrolled tailings dumps, forest fires, and poor grazing practices--contribute to this situation.

Effect of Pollutants on Receiving Water

The most significant degradation of surface waters occurs below the Reno-Sparks (Nevada) area where sewage discharges from these two cities present a health hazard to downstream water users at Wadsworth, Nevada (population 631), and Fernley, Nevada (population 566), and which forces closing of the Truckee River, during periods of low flow, by the Nevada Fish and Game Commission due to tainted flavor of the fish. Construction of the proposed sewage treatment works at Sparks and good operation of the Reno plant will improve this situation.

Other damages to the water resources caused by municipal or industrial wastes are very limited because of the high percentages of industries and communities which have installed waste treatment facilities. However, at several localities improper functioning of septic tanks or poorly maintained land disposal areas result in public health hazards, and/or nuisance conditions. In some localities, soil eroded from the land has caused silting of reservoirs and irrigation works and is damaging to fish and other aquatic life.

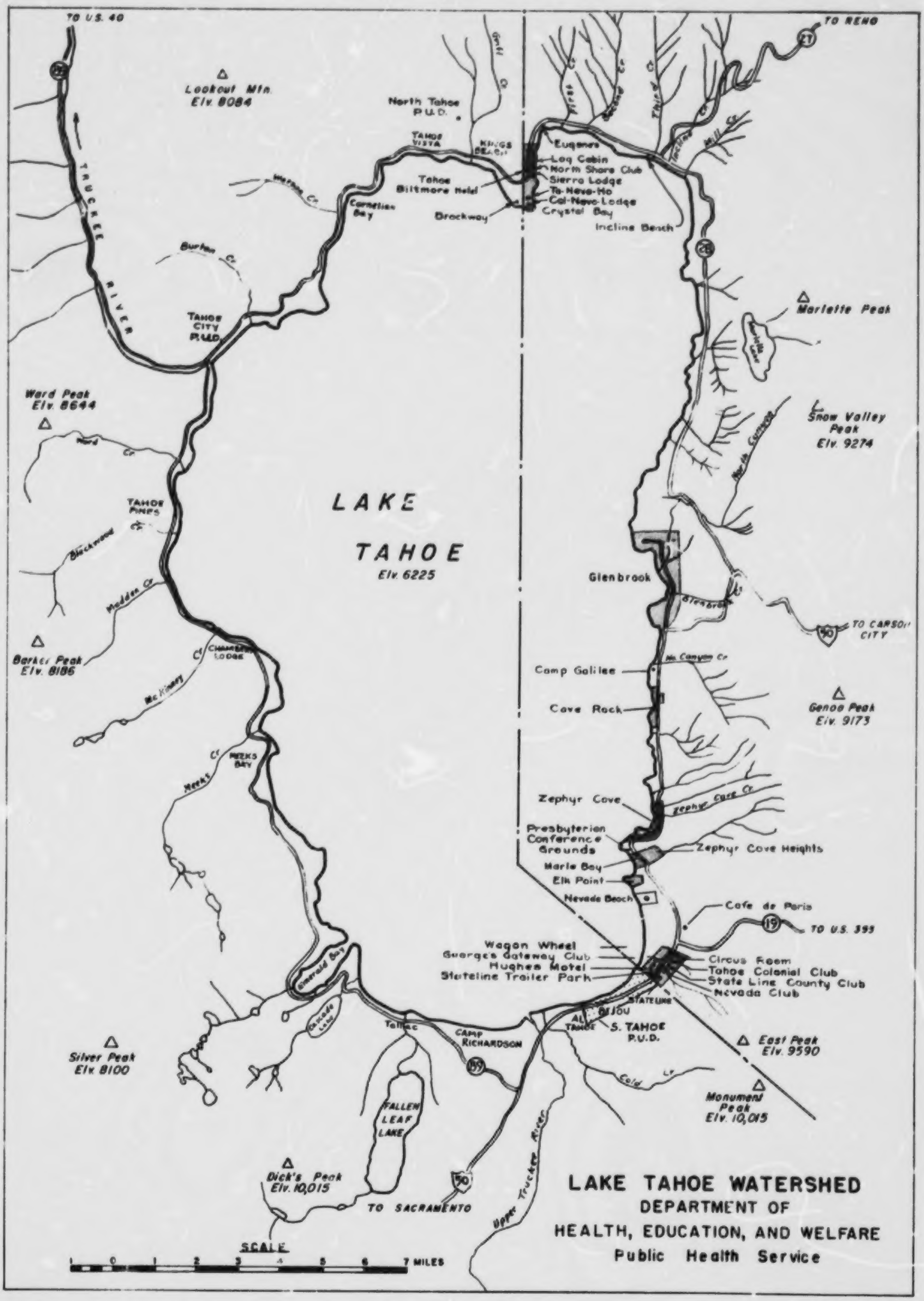
Ground water contamination is limited to one small locality--Verdi, Nevada. As a result of several contributing factors--small lots, the use of seepage pits, and the type of well construction--many of the wells at Verdi have become seriously contaminated.

Since most of the economic developments are directly dependent upon the cleanliness of the lakes and streams, control measures for waste discharges are very important. Most of the communities have recognized this fact, and have constructed, or are now planning construction of, sewage treatment facilities.

Water Use and Water Quality Objectives

The waters of the various lakes and streams are used for several beneficial purposes: domestic water supply (a large portion of it is untreated), recreation, water sports, irrigation, livestock watering, propagation of aquatic life and waterfowl, wildlife, power production, and to an extremely limited extent, industry. These beneficial uses vary on the different streams and on the several segments of the streams.

As a goal for ensuring that water of satisfactory quality will be available for these beneficial uses, broad water quality objectives have


TO U.S. 40
Lookout Mtn. Elv. 8084
TRUCKEE RIVER
North Tahoe P.U.D.
TAHOE VISTA
KINGS BEACH
Tahoe Biltmore Hotel
Carnelian Bay
Brockway
Eugene's
Log Cabin
North Shore Club
Sierra Lodge
Ta-Neva-Ho
Cal-Neva-Lodge
Crystal Bay
Incline Beach
TO RENO
27
28
Burton Cr.
TAHOE CITY P.U.D.
Ward Peak Elv. 8644
Ward Cr.
TAHOE PINES
Blackwood Cr.
Madden Cr.
Barker Peak Elv. 8186
CHAMBERS LODGE
McKinney Cr.
Meeks Cr.
MEEKS BAY
LAKE TAHOE Elv. 6225
Marlette Peak
Marlette Lake
Snow Valley Peak Elv. 9274
North Canyon
Glenbrook
Glenbrook
TO CARSON CITY
50
Camp Galilee
No. Canyon Cr.
Cave Rock
Genoa Peak Elv. 9173
Zephyr Cove
Zephyr Cove Cr.
Presbyterian Conference Grounds
Zephyr Cove Heights
Marla Bay
Elk Point
Nevada Beach
Cafe de Paris
19
TO U.S. 395
Wagon Wheel
George's Gateway Club
Hughes Motel
Stateline Trailer Park
Circus Room
Tahoe Colonial Club
State Line County Club
Nevada Club
STATELINE
BIJOU
AL TAHOE
S. TAHOE P.U.D.
East Peak Elv. 9590
Cold Cr.
Monument Peak Elv. 10,015
Emerald Bay
Cascade Lake
Tallac
CAMP RICHARDSON
89
Silver Peak Elv. 8100
FALLEN LEAF LAKE
Upper Truckee River
50
Dick's Peak Elv. 10,015
TO SACRAMENTO
SCALE
1 0 1 2 3 4 5 6 7 MILES
LAKE TAHOE WATERSHED
DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE
Public Health Service

GPO 960034

been developed for the basin by the water pollution control authorities of California and Nevada. These water quality objectives, expressed in terms of physical, chemical, and bacteriological properties, vary with the anticipated use of the water; they are presented in detail in the section of this report entitled - Use of Water Resources.

As a means of ensuring water of satisfactory quality for the beneficial uses, waste discharge requirements have been established in several portions of the basin. The Lahontan Regional Water Pollution Control Board (California Region #6) has adopted a resolution establishing discharge requirements on the California portion of the Truckee River watershed (including Lake Tahoe) which require that any sewage and industrial waste discharged into the surface waters meets the Public Health Service Drinking Water Standards. The Division of Public Health Engineering, Nevada State Department of Health, enforces specific legislation (Chapter 306 Nevada Compiled Laws) which prohibits the discharge of sewage or sewage effluents into surface waters of the Nevada portion of the Lake Tahoe watershed. In addition, Nevada has also established sewage discharge requirements for other towns on the remainder of the Truckee River system and the Lahontan Regional Water Pollution Control Board has prescribed discharge requirements for a number of waste discharges.

Measures Needed for Control of Sewage and Industrial Waste Discharges

The basic weapon for the control of water pollution caused by sewage from cities and/or wastes from industrial plants is the sewage or waste treatment plant. To maintain the water quality objectives as related to the beneficial water uses, waste treatment plants are needed at the following localities in the basin. These needs are the essential elements of the program for this basin as developed by the Nevada and California water pollution control agencies.

TABLE A

MUNICIPALITIES AND INDUSTRIES NEEDING TREATMENT PLANT IMPROVEMENTS FOR CONTROL OF WATER POLLUTION

Name	Population Served	Improvement Needed	Current Status
		CALIFORNIA	
Tahoe City	2,000	Sewer system and treatment plant	Tahoe City P.U.D. bond issue of $126,000 voted. Effluent from plant will be discharged to land (using overhead sprinklers during summer and underground leaching trenches during winter).
		NEVADA (Municipal)	
Reno	32,378	Improve operation Enlarge digester capacity	Laboratory control is needed.

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TABLE A (Cont'd)

Name	Population Served	Improvement Needed	Current Status
		NEVADA (Municipal)	
Sparks	8,170	Replacement of existing plants	Planning for construction in 1953. Estimated cost $260,000.
Minden) Gardnerville)	810	Replacement of existing plant	Inactive. (Estimated cost $28,000.)
Yerington	1,182	Replacement of existing plant	Planning.
		NEVADA (Industrial)	
Readymix Concrete Co., Reno, Nev.		Sedimentation	Inactive.

In several other portions of the basin sewage disposal practices are such that public health hazards and/or nuisance conditions result. To control these environmental factors, the action program of the states calls for the construction of sewage treatment plants at the following localities. (Table B.)

TABLE B

MUNICIPALITIES NEEDING TREATMENT PLANT IMPROVEMENTS FOR THE CONTROL OF PUBLIC HEALTH HAZARDS AND/OR NUISANCE CONDITIONS 1/

Name	Population Served	Improvement Needed	Current Status
		CALIFORNIA	
Bijou	3,000	Sewer system and treatment plant	South Tahoe P.U.D. bond issue of $260,000 voted. System, as planned, will take sewage from State Line, Nevada.
Bridgeport	250	Sewer system and treatment plant	Bridgeport P.U.D. planning to collect septic tank effluent to discharge into oxidation ponds. 2/
Tahoe Vista	100 (Est)	Sewer extension	Partially in North Tahoe P.U.D. Planning on remainder.
Brockway	400 (Est)	Sewers and sewage disposal system, or connect to North Tahoe Public Utility Dist.	Planning.

TABLE B (Cont'd)

Name	Population Served	Improvement Needed	Current Status
		NEVADA	
Crystal Bay	620	Sewers and sewage treatment.	Planning. Sewage will go to North Tahoe P.U.D. (Calif.)
State Line	730	Sewers and sewage treatment.	Planning. Sewage will go to South Tahoe P.U.D. (Calif.)
Verdi	420	Sewers and sewage treatment.	Inactive.
Carson City	3,069	Addition to plant.	Planning.
Nevada State Prison	388	Repair oxidation lagoons.	Inactive.
Fallon	2,700	Replace existing plant.	Planning (estimated cost $158,000) 3/
Hawthorne	1,600	Addition to plant.	Inactive

1/ Some of these communities do not now have sewer systems.
2/ A community sewer system and treatment facilities have been provided since preparation of this report.
3/ Plant only. Sewer and outfall $130,000 additional. Engineers' estimate.

To control potential pollution and contamination resulting from the recreational use of the watersheds, two specific control measures are under way.

a. Boats equipped with flush type toilets must comply with all pollution control laws or regulations.

b. To minimize possible pollution and contamination of streams by hunters, campers, and fishermen, a continuing "Clean Camp-Clean Stream" educational program has been undertaken. This educational program is being coordinated with the activities of the Sierra Club, the U. S. Forest Service, and other organizations interested in recreation.

Continually increasing recreational use of the Lake Tahoe area requires that the waste discharge practices of the various communities be re-evaluated periodically, preferably at least annually, to ascertain the need for any new controls. The needs of other portions of the Lahontan Basin which are used less extensively for recreational purposes will also be reviewed periodically.

The discharge of industrial wastes is a minor problem at this time due to the small number of industrial plants, and the treatment plants which the existing industries have provided. Control of industrial waste discharge in California rests with the Lahontan Regional Water Pollution Control Board and the State Water Pollution Control Board, and in Nevada with the Division of Public Health Engineering, Nevada State Department of Public Health.

No special studies were made, in connection with the development of this report, of normal versus accelerated or man-induced erosion because a determination of the need for soil-erosion control measures in this basin is beyond the scope of this undertaking. However, the subject of soil erosion warrants consideration and should be mentioned briefly in view of its significance in development of any long-range plans for conservation of water resources through pollution control. Accelerated erosion results, in addition to other effects, in impairment of water quality for certain beneficial uses by increasing suspended sediment in surface waters and in the deposition of solids in lakes and reservoirs.

To simplify the administration of the Nevada water pollution control laws, the Division of Public Health Engineering, Nevada State Department of Health, has prepared a "Water Pollution Control Code" for adoption by the Nevada State Board of Health.

Construction or renovation of the 17 indicated plants as promptly as possible, and implementation of the other specific pollution control measures that have been outlined, will insure that water of reasonably satisfactory quality will be available for the principal beneficial uses. This program will afford an added measure of protection to those whose domestic water supplies are derived from surface sources, and will insure that the economic and recreational development of the region may proceed unhindered by polluted or contaminated water.

GENERAL DESCRIPTION

NORTHWESTERN LAHONTAN BASIN

Historical Background

West of Utah's Wasatch Mountains and extending to the Sierra Nevadas of California is a vast basin-like depression--the Great Basin. The rivers of this depression do not flow to the sea, but instead discharge to lakes or sinks. Geologically, this arid expanse is divided into two parts--the Lahontan Basin* in Nevada, California, and Oregon, and the Bonneville Basin, principally in Utah.

Although there had been some exploration by trappers and others searching for a route to the west, the geography of the Great Basin remained an enigma until Fremont's exploration in 1843-44. It was then believed that somewhere in the basin there was a large lake with an overflow outlet through the Sierras--an easy river route to California. In search of this route, Capt. John Fremont made the first well-documented exploration of the Lahontan Basin.

Following the discovery of gold in California in 1848, thousands of Argonauts traveled the Sierra Nevadas over the Truckee and Carson River routes. The first permanent settlements were established as supply stations on the Humboldt trail near the base of the mountains, but the lure of gold in California retarded development. After the Comstock silver discovery in 1859, thousands recrossed the Sierras to join in the Big Bonanza. The fabulous wealth of the Comstock is legendary; however, its effect on the economy of the basin was disproportional to the actual output of precious metal--railroads were built; irrigated agriculture developed in the fertile valleys wherever water was readily available; and, for a time, a large lumber industry thrived (1).

A general exodus from the mining camps began about 1880 when many of the richer deposits of the Comstock were exhausted. With this decline of mining, agriculture became the dominating factor in the economy.

Aided by the vigorous social life of the Mother-lode in California, and by the world-wide publicity that it received, establishments catering to the touring and vacationing public were developed even before the Comstock Lode was discovered (2). Californians, then as now, were avid mountain vacationers, and, by 1889, over 6,000 persons per year were visiting the Lake Tahoe country; there were excursion steamers on the lake, and several large hotels had been built. Now the Reno-Lake Tahoe demesne is one of the Nation's most popular vacationlands.

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* The Lahontan Basin was named for Baron Armand Louis de Delondarce de La Hontan, French traveler, writer and soldier of the late seventeenth century.

Northwestern Lahontan Basin, having an area of 35,000 square miles, lies between 38 and 43 degrees North latitude and 117 and 122 degrees West longitude. Approximately 82 percent of the basin is in Nevada, 17 percent in California, and 1 percent in Oregon (Table 3, Appendix). The basin is located along the Nevada-California state line and extends from the headwaters of the Walker River northward to the Warner Lakes of Oregon. It is comprised of three "sub-basins,"* described in the Public Health Service "Summary Report on Water Pollution, Great Basin Drainage Basin" (3).

Topography

The topography is one of great extremes. The high, rugged peaks of the Sierra Nevadas contrast with the Blackrock Desert of Nevada. Beautiful Lake Tahoe in the high, timbered mountains is diametrically opposed to the alkaline desert sinks of the rivers.

Instead of a unified river system, there are a number of discrete rivers terminating in sinks or evanescent lakes. Of these rivers, the Truckee, Carson and Walker are the largest. The Truckee and Carson systems are connected by the Truckee canal which diverts water from the Truckee into the Lahontan Reservoir on the Carson River. Smaller streams include the Quinn and Kings Rivers in Nevada, Susan River, and 20-Mile, Deep, and Honey Creeks in California.

In the Sierras, there is a chain of lakes that extends from the Oregon border to the southernmost portion of the basin. The largest of these, Lake Tahoe, located on the California-Nevada state line at an elevation of 6,225 feet, is 23 miles long and 13 miles wide.

In the desert there are several lakes, the largest being Pyramid, Honey and Walker, that mark the termini of the streams. The water level of the lakes fluctuates widely depending upon rainfall and irrigation diversions (4).

Geology

Rocks of varied types and ages occur in the region. Older crystalline rocks, often capped by lava, form the mountain blocks. Unconsolidated alluvium of the Quarternary Age forms the valley fill. The western boundary of the basin is formed by a massive granite intrusive thrust. This high Sierra Nevada range is composed mostly of granite and some metamorphic rock with extensive lava fields.

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* Lake Tahoe, Truckee, and Carson Rivers Sub-basin.
Walker River Sub-basin.
Northwest Nevada and Northeast California Sub-basin.

Highly productive alluvial soils predominate at the base of the mountains, near streams, and in the upper valleys of the Carson and Walker Rivers. The lower lying, poorly drained areas contain high concentrations of soluble salts, and hence are not suitable for agriculture. Soils of the mountain ranges are shallow and stony, and are subject to rapid natural erosion. In many places the underlying bedrock is still exposed (5).

Ground water is available in varying quantities in many of the valleys. Probably these ground water supplies will eventually be developed as sources of supplementary irrigation supplies and as primary domestic water supplies. A joint study is now being made by the United States Geological Survey and office of the State Engineer (Nevada) to determine the extent of the ground water basins. Chemical analyses of well water show that, in general, the water quality is satisfactory for domestic and irrigation uses (5, 6). At only one area, Verdi, Nevada, has pollution of underground water become a problem (7).

The region has a great variety of mineral resources, the most important of which are the non-ferrous metals--copper, lead, gold and silver. Less important non-ferrous ores include tungsten, molybdenum, quicksilver, antimony and arsenic. Industrial minerals--borate, potash, sulfur, talc and gypsum--contribute to the economy of the basin.

Climate

Due to a rugged and varied topography there are wide extremes in rainfall and temperature. Geographic variations in precipitation caused by elevation and exposure to moisture bearing winds range from over 45 inches at Soda Springs, California, near Lake Tahoe, to 3 inches at Thorn, Nevada (Table 4, Appendix). Most of the precipitation is in the winter and, consequently, it is impossible to produce crops without irrigation. A maximum of 225 inches of snow has been recorded at Marlette Lake, at an elevation of 8,000 feet, and snow packs in excess of 100 inches are common throughout the mountainous portion of California.

Over most of the basin there is a wide seasonal and diurnal temperature range. The extremes vary from 28 degrees below zero at Soda Springs, to 110 degrees at Lahontan, Nevada. Relative humidity is low--for example, Carson City has a 5 a.m. average of 63% and a 5 p.m. average of 37%. Evaporation rates exceed 40 inches per year over much of the basin.

Many types of vegetation characterize this basin. Sagebrush, bunch grass, and the northern desert shrubs predominate in the valleys, whereas grasses, pinyon and juniper dominate in the lower mountains. Ponderosa pine, Douglas fir, and aspen grow at the higher elevations. The length of the growing season is related directly to elevation and varies from 59 days at Truckee in the Sierra to 168 days at Thorn, Nevada.

Hydrology

The seasonal flow of nearly all of the streams varies widely (Table 5, Appendix). Fed principally from melting snow on the mountain slopes one-half to three-fourths of the annual runoff is during April, May and June. Spring floods are followed by weeks of low flows. These low flow periods, rather than the total yearly runoff, are the controlling factor in determining the degree of treatment required for wastes discharged. Several reservoirs have been constructed to store flood water for irrigation during low flow periods; however, on only a few streams is reservoir capacity sufficient for full regulation (Table 7, Appendix). Measured flows are generally reduced by upstream irrigation diversions and may not represent the total runoff above the gages (8).

Waters of the Truckee River are regulated and distributed in accordance with the terms of the 1944 Truckee River agreement. This agreement limits the release of stored water to amounts required to maintain a flow at Iceland,* California, of 500 sec.-ft. during the irrigation season, and 400 sec.-ft. during the winter season for storage, power production, and other downstream uses. The agreement further specifies that during the winter months, whenever the water surface elevation of Lake Tahoe is below 6,226.0 feet (3 feet above the outlet), the flow at Iceland shall be reduced to 350 sec.-ft., and to 300 sec.-ft. when the lake elevation drops to 6,225.25 feet, provided this can be accomplished by controlling releases from Lake Tahoe. On the Little Truckee River, the chief headwater tributary of the Truckee, Independence Lake, provides 20,000 acre-feet of storage, and Boca Reservoir, 41,000 acre-feet. Donner Lake on Donner Creek stores 10,000 acre-feet. Smaller lakes are maintained at near constant levels for recreational purposes (5).

The Truckee River heads in Lake Tahoe at the overflow outlet at an elevation of approximately 6,225 feet. The level of the lake is regulated by headgates at Tahoe City and provides active controlled storage for 732,000 acre-feet of water--primarily for use in irrigation projects. The Truckee extends from Lake Tahoe, elevation 6,225 feet, to Pyramid Lake, elevation, 3,900 feet, a distance of about 105 miles. Hardman and Venstrom (4) estimate that Pyramid and Winnemucca Lakes received an annual average of 640,000 acre-feet of water from 1906 to 1917, and 212,000 acre-feet from 1918 to 1939. During this 33-year period, the level of Pyramid Lake dropped 48 feet, preventing the river water from reaching Winnemucca Lake, indirectly causing this lake to become dry.

The east and west forks of the Carson River flowing northward down the slopes of the Sierra Nevada join in the Carson Valley at the base of the mountains to form the main stem of the river. From this junction, the river flows northeast about 108 miles to terminate in Carson Sink, a natural depression with no outlet. Silver King Creek,

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* A gaging station near the state line.

Wolf Creek, Markleeville Creek, and Pleasant Valley Creek on the east fork of the Carson River, and Clear Creek on the Carson are the principal tributaries. The total length of the Carson River is about 156 miles. The elevation of its upper mountain tributaries is about 8,600 feet--its terminus in Carson sink is slightly over 3,800 feet.

The East and West Walker Rivers rise in the Sierra Nevada and flow generally northward joining at the upper end of Mason Valley in Nevada to form the Walker River. The natural flow of the river is greatly modified by two on-channel and one off-chanel reservoirs, and by direct irrigation diversions. During the late summer months little or no water reaches Walker Lake. In the ten year period* prior to the construction of Weber Reservoir (River Mile 14) the annual discharge of the river, including return irrigation flow, was only 24,440 acre-feet (8).

The Susan River** rises in small lakes at altitudes of about 5900 feet above sea level north of Caribou Lake. It takes a general southeasterly course to the point at which it enters Honey Lake, of which it is the principal feeder. Susan River is about 50 miles in length, with a fall of about 2000 feet. Its principal tributaries are Willards, Williams, Bridge, Cheney, Piute, Gold Run and Willow Creeks. The mean annual precipitation, as indicated by records kept at Susanville since 1885, is 12.20 inches. The river furnishes water for irrigation of lands adjoining the stream.

Honey Lake, into which the Susan River flows, occupies a shallow depression in the eastern part of Lassen County. The lake varies in area with the seasons, as well as from year to year and in times of unusual aridity has been completely dry. Its shores are, as a rule, low and marshy and in places form broad tule swamps. Its water is strongly alkaline, unfit for human use, and always of a greenish-yellow color from the impalpable mud it holds in suspension.

In the Northwestern Lahontan Basin there are many sub-basins between which there is no movement of surface water and little passage of ground water. Present development of ground water in the Northwestern Lahontan Basin is limited as is also knowledge regarding the number and characteristics of the ground water basins. Mineralization is not uncommon in the ground water of many of the sub-basins due to convergent drainage and recent geologic histories. It is not only important to find and develop ground water to supplement present surface water supplies, but wells are also necessary in many parts of the basin for additional irrigation and stock-watering purposes (5).

From the viewpoint of waste discharges it is important to avoid impairment of quality of ground waters by unsatisfactory waste disposal practices. An example of ground water pollution in the Basin occurred at Verdi, Nevada.

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* 1933 Schurz, Nevada; gaging station discontinued after the completion of Weber Reservoir.

**Water Supply Papers 297 and 637 - U.S. Geological Survey.

The ground water in the vicinity of Verdi, obtained in large part from private shallow dug wells, was unsatisfactory for many years because of its exposure to sewage contamination. After heavy rains of November and December 1950 most of the samples collected from wells indicated the presence of coliform bacteria. This led, in 1951, to action by the residents of Verdi to investigate the possibility of constructing a municipal well to supply water for the community. The aid of the U. S. Geological Survey was enlisted, in cooperation with the State Engineer* to make a study of ground water conditions in the vicinity of Verdi.

The report on this study states: "The main source of pollution is probably the effluent from the numerous septic tanks, cesspools, and outhouses, many of which are less than 100 feet from the wells. The permeable character of the alluvium indicates that there is an excellent opportunity for the effluent to percolate down to the water table, mix with the main body of ground water and move with it through the alluvium. This is true also of polluting material deposited on the land surface, from which bacteria may be carried to the ground water body by the downward percolation of precipitation or irrigation water. It is probable that much of the widespread pollution noted after the heavy rains in November and December 1950 resulted from downward percolation of precipitation through contaminating material."

Within the Truckee River and Lake Tahoe watersheds there has been no extensive development of ground water resources. This is due to the fact that there are adequate surface water supplies throughout the area. The largest development of underground water resources is by the Truckee Public Utility District. For the most part their supply has been satisfactory, although one well has become contaminated within the past two years and the source of the contamination is unknown. There are a few small individual domestic wells in that area, and some development of springs. Precautions are taken where waste discharges occur in close proximity of water wells and springs, either by the State Department of Public Health, the Regional Water Pollution Control Board, or the local health department.

The following excerpts from a recent report of a Task Group of the American Water Works Association on Underground Waste Disposal are believed to be particularly pertinent to this subject:

"The proper time to control underground pollution is before it occurs. If corrective measures are deferred until proof of actual damage is at hand, so much pollution is likely to have taken place that restoration of purity will be difficult, costly, and slow, if possible at all...."

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* Ground Water in the Vicinity of Verdi, Washoe County, Nevada. May 1951. Nevada State Engineer and U. S Geological Survey.

"The rate of increase in ground water use indicates that full development of local ground waters may be expected within the foreseeable future throughout great portions of the nation. The problem of polluted ground waters cannot, therefore, be solved by abandoning them in favor of alternate sources...."

Economic Development

In 1950, the population was approximately 92,000 (9) over half of which was in the Reno-Sparks area. During the past 30 years there has been a distinct trend toward urbanization, over 90% of the growth occurring in the urban areas. Important population centers include: Reno-Sparks, Hawthorne-Babbitt, Susanville, and Lake Tahoe area which has a peak summer population of 50,000 (10).

Table I

Population Increase and Distribution
in the Northwestern Lahontan Basin

Year	Total Permanent Population	Percent of Total Population		
		Rural	Urban[1/]	Reno-Sparks Twps.
1920	44,000	48	14	38
1930	54,000	41	12	47
1940	64,000	38	14	48
1950	92,000	28	19	53

1/ Excluding Reno-Sparks Townships

The economy is founded upon recreation, irrigated agriculture, livestock raising, and, to a lesser extent, logging. Manufacturing is of only minor importance (5).

Agriculture, although limited by the amount of water available, is one of the most important economic pursuits. Nearly 400,000 acres are irrigated from the principal river systems (Table 6, Appendix), and, in addition, there is a considerable acreage irrigated from the smaller streams. Much of this land is used for production of alfalfa and wild hay, and only a small percentage for production of cereal crops or vegetables. The income from agricultural products in 1950 was estimated at over 18 million dollars, about 80% of which was accounted for by the sale of livestock or livestock products (11).

Logging and related activities--relatively unimportant in Nevada--are of prime importance in the California counties where, in 1948, over 54 million board-feet of lumber were cut. Most of the timber comes from the six National Forests--Modoc, Toiyabe, Lassen, Plumas, Tahoe, and El Dorado--that are wholly or partially within the basin. Included within the boundaries of these forests is much of the valuable mountain watershed.

The principal mineral products include: diatomaceous earth, gold, silver, fluorspar, tungsten, turquoise, magnesite, iron, perlite, building stone, sand and gravel, copper, sulfur ore, limestone, and gypsum. The value of the minerals produced is estimated at over two million dollars yearly. Aside from a few large deposits, most of the mining has been on a relatively small scale; however, a large plant is now being constructed near Yerington, Nevada, to extract copper from the extensive bodies of low grade ore. Sulfur needed in the extraction process will be mined near Markleeville, California, and processed at Yerington, Nevada. Plaster board and other gypsum products are manufactured at a large plant near Gerlach, Nevada.

In many respects, the Lake Tahoe-Honey Lake Region is a transportation portal to northern California. Main lines of the Southern Pacific and Western Pacific railroads and two transcontinental highways, U.S. 40 and 50, cross the basin in an east-west direction.

Recreation and tourist activities are of primary importance to the local economy. The Tahoe country is nationally known for its seasonal resorts and tourist accommodations, and the lake is rimmed by summer cabins and resorts. Legalized gambling in Nevada attracts many visitors.

The rugged terrain is preserved in almost pristine form; hence the region is unsurpassed for many outdoor sports. Fishing is popular in the mountain streams and lakes. The California Department of Fish and Game has estimated that the California section of the Truckee River system, alone, has a sport fishery value approaching a million dollars. Deer, found in large numbers in the mountains, provide sport for thousands of hunters. These recreational activities are directly dependent upon the beauty and cleanliness of the region's streams and lakes.

Several wildlife refuges and wildlife management areas--the Sheldon National Antelope Refuge, Anaho Island National Wildlife Refuge, and the Stillwater National Wildlife Management Area--provide sanctuary for antelope, waterfowl, and other wildlife. The most important waterfowl habitat in the entire Lahontan Basin is the Stillwater National Wildlife Management Area near the Carson River Sink.

The Winnemucca National Wildlife Refuge is expected to be abolished soon and the Fallon National Wildlife Refuge is included, for the most part, in the Stillwater National Wildlife Management Area.

USE OF WATER RESOURCES

The Northwestern Lahontan Basin does not have a unified river system but instead has many discrete rivers--some small, others comparatively large.

Lake Tahoe-Truckee River System

The Truckee serves many purposes--domestic water supply, recreation and fishing, irrigation and livestock watering, and power production.

Lake Tahoe is a source of domestic water supply for many of the residents and vacationers. Many of these supplies are not chlorinated or otherwise treated. The maximum summer population at Lake Tahoe in 1948 was 27,589 and may be expected to double within the next 25 years (10)*. Table II shows the use and source of water supply for homes and resorts located on the lake.

Table II

Use and Source of Water - Lake Tahoe 1948

Type	Total Consumer Months	Source of Water (Consumer Months)		
		Surface Water	Wells	Lake Tahoe
Resorts	36,572	16,399	9,776	10,397
Homes	64,304	35,770	21,618	6,916
Camps	7,102	4,321	1,472	1,309
Total	107,978	56,490	32,866	18,622
% of Total	100	52.3	30.4	17.3

In addition to the established domestic supplies numerous campers and fishermen doubtless obtain drinking water from streams or lakes (12).

Truckee, California, ordinarily obtains water from springs and wells; however, supplementary water is taken from a shallow well on the bank of the Truckee River. The Southern Pacific Railroad at Truckee also has a water intake in the river.

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* Another source (12) estimates the current summer population at 50,000 in 1951.

The public water supply for the Reno-Sparks area--14 to 30 million gallons daily--is taken from the Truckee River above Reno. Treatment consists of coagulation sedimentation and chlorination. Due to the high quality of the water it has not been necessary to install filters.

At Fernley and Wadsworth, Nevada, combined population 1200, untreated Truckee River water is piped to yards for home irrigation use, and is available from a distribution system for fire protection, with water piped into many homes for sanitary uses, some even being used for drinking purposes.

The Lake Tahoe-Truckee region is one of the best known resort areas in the United States. Much of its popularity is based upon the natural beauty and cleanliness of its many streams and lakes. On the shores of Lake Tahoe alone there are over a hundred resorts and camps. Principal outdoor recreational uses include: camping, boating, swimming, fishing, hunting, and winter sports. The very economy of the region is dependent upon this recreational use of water.

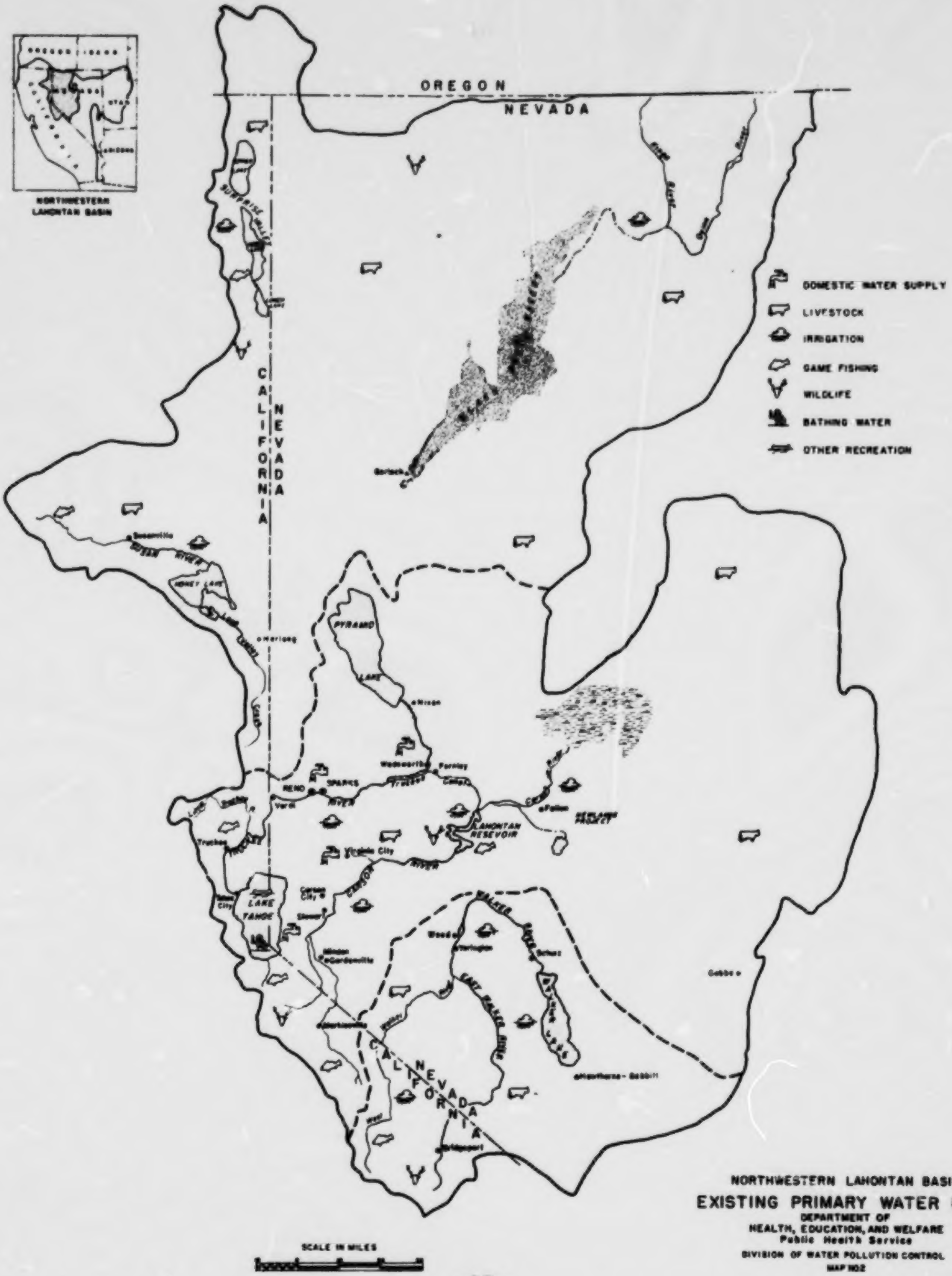
When the Truckee River was discovered it was teeming with cutthroat trout; however, upstream irrigation diversions, heavy fishing pressures, and to some extent pollution by paper mill wastes near Floriston (during early decades of 20th century) resulted in a great reduction in the trout fishery.

Improved fish stocking practices, better regulation of low stream flows and also closing of the paper mill at Floriston have resulted in the Truckee River again becoming the most important fishing stream in the Northwestern Lahontan Basin. The dominant fish species in the Truckee River are the Rainbow and German-brown trout. Some cutthroat trout and black bass are also found.

During the past several years, creel censuses have been taken on the opening day of the fishing season on the Nevada portion of the Truckee River by the Nevada Fish and Game Commission. A survey made in 1951 showed that, on weekends, throughout the season, a total of over 2,600 anglers fished the Truckee between Reno and Verdi (13). It is not unusual to observe over 100 persons fishing in the river where it flows through Reno.

Creel Census Data - Truckee River - Nevada (sample count) (13)

	1949	1950	1951
Total No. of Anglers Observed	166	120	112
No. of Trout in Creel	259	87	360
Average Catch	1.6	0.73	3.2


NORTHWESTERN LAHONTAN BASIN
OREGON
NEVADA
CALIFORNIA
DOMESTIC WATER SUPPLY
LIVESTOCK
IRRIGATION
GAME FISHING
WILDLIFE
BATHING WATER
OTHER RECREATION
SURPRISE VALLEY
Gerlach
Susanville
SUSAN RIVER
HONEY LAKE
Herlong
PYRAMID
LAKE
Nixon
Wadsworth
Fernley
RENO
SPARKS
Verdi
TRUCKEE
RIVER
Truckee
Fallon
NEWLANDS PROJECT
LAHONTAN RESEVOIR
Virginia City
CARSON
RIVER
Carson City
LAKE
TAHOE
Tahoe City
Minden
Gardnerville
WALKER RIVER
Yerington
EAST WALKER RIVER
WALKER LAKE
Hawthorne - Babbitt
Gabbs
Bridgeport
SCALE IN MILES

NORTHWESTERN LAHONTAN BASIN

EXISTING PRIMARY WATER USES

DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE
Public Health Service
DIVISION OF WATER POLLUTION CONTROL
MAP 1102

The California Department of Fish and Game estimates that 60,000-75,000 anglers visit the California portion of the Truckee watershed each year and that the annual value of this sport fishing approaches one million dollars.

Water is taken from the Truckee for the irrigation of about 38,000 acres of land, most of which is located in the Truckee Meadows near Reno. Much of this irrigated land is used for growing hay and other forage crops although several hundred acres are used for growing vegetables (5).

At Derby Dam, located downstream from Sparks, water is diverted to the Lahontan Reservoir on the Carson River for ultimate use in the Newlands Project. About 4,000 acres are irrigated directly from this canal. In addition to irrigation use, the river serves as a source of water for thousands of head of livestock.

Five small hydroelectric generating plants are installed along the Truckee River between Lake Tahoe and Reno. These plants have a combined capacity of 9,400 kilowatts.

Carson River

No community or industrial water supplies are taken from the Carson River, or from its tributaries, although some fishermen and campers may occasionally drink the river water.

In its upper reaches, the river flows through steep canyons that have precluded major irrigation development, whereas in Nevada, large irrigation projects have been developed in the Carson and Carson Sink Valleys. One of the first Federal irrigation projects, the Newlands Project, is located in the latter valley. Lahontan Reservoir, located on the Carson River, stores water for use in this project.

The Carson River supplies water for irrigation of 97,400 acres of land and for livestock watering, and, as in other parts of the Lahontan Basin, the principal crop is hay for winter feeding.

Recreational use of the Carson is primarily limited to fishing and camping, although there are some resorts in the mountainous section of the watershed. Though it is an important fishing stream, because of its distance from population centers the Carson is not as heavily fished as the Truckee. The dominant species of fish in the Carson River is the rainbow trout although a few brown and cutthroat trout are found. In view of the recreational development in the adjacent areas, it seems only a matter of time until this region will also be developed.

The thousands of acres of marshland that mark the end of the Carson River probably constitute the most important waterfowl oasis in the entire region. Hundreds of thousands of ducks frequent this sink and it has been estimated that 35,000 ducks are taken annually (5). Large numbers of muskrat inhabit the marsh land, and several thousand muskrats are trapped yearly.

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There is a small hydroelectric plant located in the Lahontan Dam with an installed capacity of 1,500 kilowatts.

Walker River

No community or industrial water supplies are taken from the river and it is not anticipated that any such uses will develop.

Irrigated agriculture is the dominating economic factor in this watershed. Almost the entire flow of the Walker River is used for irrigating approximately 112,000 acres--37,000 from the West Walker, 27,500 from the East Walker, 44,000 from the main stem, and 3,700 in Walker Lake. The principal crop is hay for winter feeding of livestock, and only a small portion of the irrigated acreage is used for production of grain and vegetables. In addition to irrigational use, stock watering is a very important water use.

Recreational use of the Walker River watershed is largely limited to hunting, fishing and camping. Although the area has a high recreational potential in the mountainous headwaters region, it has not been as highly developed as the neighboring Tahoe or Mammoth Lake regions. The Walker River is well stocked with rainbow trout, and is one of the important fishing streams of the region. Fishing pressure on the river is limited due to the distance from major population centers. However, as the fishing pressure increases in the more accessible areas, greater numbers of fishermen can be expected in this area.

There are no hydroelectric developments on the Walker River.

Susan River

The Susan River heads on the east slope of the Sierra Nevadas and flows generally east through Susanville into shallow, alkaline Honey Lake. In the upper 32 miles of its course above Susanville the river flows through canyons and valleys in heavily wooded country. Below Susanville the river flows through 23 miles of irrigated valley land. About 10 miles from Honey Lake the river channel divides into several branches.

No community water supplies are taken from the river. However, a number of logging companies divert water from the Susan River for their millponds. The overflow from these millponds is returned to the stream.

The principal use of the water of the Susan River is for irrigation in Honey Lake Valley. Approximately 40,000 acres are irrigated in the Honey Lake drainage area, over 32,000 acres of which are in the lower Honey Lake Valley.

Table III
WATER USE ON PRINCIPAL RIVER SYSTEMS
NORTHWESTERN LAHONTAN BASIN

River System	Portion of River System (Zone) (River Miles)	Water Uses Within Zone	Downstream Water Uses
Truckee	Lake Tahoe and inflowing stream. (Above river mile 106.)	Municipal domestic water supply, recreation, water sports, fishing, wildlife, livestock watering.	Domestic water supply, recreation, fish and wildlife, irrigation, livestock watering, power production.
	Lake Tahoe to Reno. (105 to 52.)	Municipal domestic water supply, recreation, fish and wildlife, irrigation, livestock watering, power production.	Domestic water supply, fish and wildlife, irrigation, livestock watering.
	Reno to Pyramid Lake (52 to 0.)	Municipal domestic water supply, fish and wildlife, livestock watering, irrigation.	Pyramid Lake - fish and wildlife, stock watering.
Carson	East and West Carson Rivers. (Above river mile 100.)	Domestic water supply*, irrigation, fish and wildlife, livestock watering, recreation.	Irrigation, fish and wildlife, livestock watering, recreation, power production.
	Main stem of river. (100 to 0.)	Irrigation, fish and wildlife, livestock watering.	Carson Sink - waterfowl, fish and wildlife.
Walker	East and West Walker Rivers. (Above 48.)	Domestic water supply*, irrigation, fish and wildlife, livestock watering, recreation.	Irrigation, fish and wildlife, livestock watering, recreation.
	Main stem of river. (48 to 0.)	Irrigation, fish and wildlife, livestock watering.	Walker Lake - livestock watering, fish and wildlife.

Table III continued

Susan	Above Susanville	Domestic water supply*, recreation, irrigation, fish and wildlife, livestock watering.	Irrigation, livestock watering, waterfowl, fishing.
	Susanville to Honey Lake	Irrigation, livestock watering, waterfowl, fishing.	Honey Lake - irrigation, livestock watering, waterfowl, fishing.
Quinn and Kings River	Entire River	Irrigation, livestock watering, fish and wildlife.	Black Rock Desert (sink).

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* Used as a source of potable water by campers and fishermen.

Industrial water use from the Susan River is limited to lumbering activities. Four large permanent sawmills at Susanville use river water for their log ponds.

Recreation use of this portion of the basin is limited primarily to outdoor activities--camping, hunting and fishing.

Other Small River Systems

There are many other small streams, including the Quinn River in Nevada, 20-Mile, Deep, and Honey Creeks in California. Many of these smaller streams are used for irrigation and livestock watering and are also important from the fish and wildlife standpoint.

WATER QUALITY OBJECTIVES

The varied uses of the water resources of the Northwestern Lahontan Basin have been indicated. Certain of the streams supply water for a variety of purposes; others are used primarily for agriculture and by wildlife. Generally, water use on the headwaters is not the same as on the lower reaches of the streams.

Beneficial water use, water quality objectives and the need for sewage treatment are all closely inter-related. Where beneficial water use includes domestic water supply the degree of sewage treatment needed may be high, particularly where dilution is limited or water treatment facilities are not provided. Where beneficial water use is limited to agricultural use and/or support of fishlife, the degree of sewage treatment may be adjusted downward.

Beneficial water uses for the streams of this basin are shown by stream sections in Table III. Broad water quality objectives related to these beneficial water uses are outlined in the following paragraphs as practical guides in developing project needs. For detailed information on the subject of water quality criteria it is suggested that the report, "Water Quality Criteria," prepared by the California Institute of Technology for the California State Water Pollution Control Board, be consulted (16).

Water quality objectives consisting of fixed standards are not compatible with the California principle of prescribing individual waste discharge requirements which may be revised from time to time. Therefore, the following objectives are considered to be generalized long-range guides.

Domestic Water Supply

The primary factor that determines the suitability of water for domestic use is its bacteriological quality. The micro-organisms which cause typhoid fever, dysentery and gastro-enteritis are found in sewage; hence water which is to be used for domestic water supply must be protected against sewage contamination.

For water supplies which are chlorinated but not otherwise treated a guide to the coliform density allowable in the raw water is provided in the "Manual of Recommended Water-Sanitation Practice," recommended by the U. S. Public Health Service. This manual was prepared in 1942 by a technical committee of Public Health Service officers and was intended to serve as a guide to the reporting (state) agency in application of the Public Health Service Drinking Water Standards of 1942 to interstate carrier water supplies. This manual, page 11, in referring to Group II waters as Water Requiring Simple Chlorination or its Equivalent, states: "This group includes both underground and surface waters subject to a low degree of contamination, and meeting the requirements of the Public Health Service Drinking Water Standards in all respects except as to coliform bacterial content, which should average not more than 50 per 100 ml. in any month."

The limiting value of 50 coliforms per 100 ml. is given as a guide rather than as an inflexible rule. Consideration should be given to all aspects of the character and quality of the raw water, fluctuations in quality and type of supervision provided in treatment, in addition to the bacteriological characteristics of the raw water.

In general, health authorities in the United States have required treatment, such as coagulation and filtration, in addition to chlorination, for raw waters exceeding this average density of coliform organisms.

Surface water cannot be considered safe for domestic consumption unless it is chlorinated or otherwise treated. However, where appreciable numbers of people choose to use such a water supply, a large degree of protection can be afforded by the local and state water pollution control agencies in setting waste discharge requirements that dictate a high degree of treatment. In all such cases, land disposal of sewage plant effluent is encouraged. In Nevada, special legislation has been enacted which specifically prohibits the discharge of sewage or sewage effluents into Lake Tahoe or other surface waters in the Nevada portions of the Lake Tahoe watershed. (Chapter 306, Nevada Compiled Laws.)

The Lahontan Regional Water Pollution Control Board has established discharge requirements which specify that all sewage or sewage effluent discharged into Lake Tahoe shall meet the requirements of the Public Health Service Drinking Water Standards (Appendix B).

The California State Department of Public Health during the long period when permits were required for the disposal of sewage established a policy of not permitting sewage to be disposed into Lake Tahoe. The state and those local health authorities who have jurisdiction of the portion of Lake Tahoe that is within California will continue to exert every influence to prevent future discharges of sewage into the lake.

In addition to being bacteriologically safe, water used for domestic purposes should not contain toxic, taste-producing, or otherwise harmful substances. Raw water should be free of excessive acid or substances which might interfere with chlorination or other water treatment.

The following standards were developed by the Public Health Service for water supplies used by interstate carriers. These standards have been adopted by the American Water Works Association and have been generally accepted in the United States as representing safe and desirable limits for the bacteriological, chemical, and physical properties of potable water (18).

Table IV

Coliform type bacteria	MPN not exceeding approximately	1.0/100 ml.*	
Lead	shall not exceed	0.1	ppm
Fluoride	" " "	1.5	ppm
Arsenic	" " "	0.05	ppm
Selenium	" " "	0.05	ppm
Hexavalent chromium	" " "	0.05	ppm
Turbidity (Silica scale)	" " "	10	ppm
Color (Platinum-cobalt scale)	" " "	20	ppm
Copper	should preferably not exceed	3.0	ppm
Iron and manganese combined	" " " "	0.3	ppm
Magnesium	" " " "	125	ppm
Zinc	" " " "	15	ppm
Chloride (Cl)	" " " "	250	ppm
Sulphate (SO_4)	" " " "	250	ppm
Phenolic compounds	" " " "	0.001	ppm
Total solids	" " " "	500	ppm**

* This standard is given in terms of percentage of confirmed positive fermentation tubes and is roughly equivalent to a Most Probable Number of 1.0 per 100 ml. of water (See Appendix C).

** Total solids of 1,000 ppm are acceptable under certain conditions.

Where downstream water use includes domestic water supply, sewage and waste treatment should be provided so that the foregoing bacteriological and chemical criteria will not be exceeded in the delivered domestic water supply. On the Lake Tahoe watershed, where extensive use is made of untreated surface water for domestic purposes, the Lahontan Regional Water Pollution Control Board has specified that sewage treatment plant effluent should meet the requirements of the Public Health Service Drinking Water Standards (18), and in Nevada a special pollution control law (Chapter 306, NCL) specifically prohibits the discharge of any sewage or sewage effluent into the surface water of the Lake Tahoe watershed.

Irrigation Water Quality

Agriculturally, the suitability of water for irrigation is generally evaluated in terms of total dissolved solids, percent sodium, and boron content. Other factors involved in agricultural use of irrigation water are the boron sensitivity of the crops grown, the drainage of the soil to be irrigated, and salinity of the soil.

The following table gives an accepted standard for irrigation water.

The following tables are based upon the permissible limits for electrical conductivity, percent sodium and concentration of boron given in Technical Bulletin No. 962 of the U. S. Department of Agriculture, entitled "The Quality of Water for Irrigation Use," September 1948.

Table V

Permissible limits for electrical conductivity and percent sodium for several classes of irrigation water.

Classes of Water		Electrical Conductivity $EC \times 10^6$ at 25° C	Percent Sodium
Rating	Grade		
1	Excellent	< 250	< 20
2	Good	250 to 750	20 to 40
3	Permissible	750 to 2000	40 to 60
4	Doubtful	2000 to 3000	60 to 80
5	Unsuitable	> 3000	> 80

Permissible limits for boron of several classes of irrigation water. Limits are expressed in parts per million (ppm).

Classes of Water		Sensitive Crops (ppm)	Semitolerant Crops (ppm)	Tolerant (ppm)
Rating	Grade			
1	Excellent	< 0.33	< 0.67	< 1.00
2	Good	0.33 to 0.67	0.67 to 1.33	1.00 to 2.00
3	Permissible	0.67 to 1.00	1.33 to 2.00	2.00 to 3.00
4	Doubtful	1.00 to 1.25	2.00 to 2.50	3.00 to 3.75
5	Unsuitable	> 1.25	> 2.50	> 3.75

Table VI

Relative Tolerance of Crop Plants to Boron
U.S. Department of Agriculture Technical Bulletin No. 962

Sensitive to boron	Semitolerant to boron	Tolerant to boron
Lemon	Lima bean	Carrot
Grapefruit	Sweetpotato	Lettuce
Avocado	Bell pepper	Cabbage
Orange	Tomato	Turnip
Thornless blackberry	Pumpkin	Onion
Apricot	Zinnia	Broadbean
Peach	Oat	Gladiolus
Cherry	Milo	Alfalfa
Persimmon	Corn	Garden beet
Kadota fig	Wheat	Mangel
Grape (Sultanina and Malaga)	Barley	Sugar beet
	Olive	Palm (Phoenix canariensis)
Apple	Ragged Robin rose	
Pear	Field pea	Date palm (P. dactylifera)
Plum	Radish	
American elm	Sweet pea	Asparagus
Navy bean	Pima cotton	Athel (Tamarix aphylla)
Jerusalem-artichoke	Acala cotton	
Persian (English) walnut	Potato	
Black walnut	Sunflower (native)	
Pecan		

Generally accepted bacteriological standards for irrigation water have not been established because the relationship between the bacteriological quality of irrigation waters and the possibility of disease transmission through crops irrigated with sewage, sewage treatment plant effluents, or sewage polluted water has not been completely evaluated.

The California State Department of Health in 1933 adopted regulations controlling the use of partially treated or disinfected sewage treatment plant effluents. These regulations prohibited the use of such effluent for the irrigation of truck crops, berries, or low growing fruit. Field crops may be irrigated with such effluents, provided that no milk cows are pastured on land moist with such sewage or have access to ditches carrying such sewage (20).

A common practice on farms and ranches is to obtain all or a portion of the domestic water supply from nearby irrigation systems. When these systems carry water containing sewage there is a much greater danger of disease transmission to the water users than would be the case if the irrigation water was free from sewage contamination.

Swimming and other recreation use:

As with irrigation water, factual information and epidemiological evidence as to what constitutes a safe coliform density in water used for swimming or other recreational uses is lacking. Evaluation of the significance of the coliform densities in natural bathing places is complicated by the natural coliform population of the water--coliform type bacteria washed from the hills by rains and melting snow.

The Joint Committee on Bathing Places of the Conference of State Sanitary Engineers and the Engineering Section of the American Public Health Association has suggested that the final determination as to the suitability of outdoor bathing places be determined by a sanitary survey of the area using bacteriological information as a guide only (15). Many coliform standards have been set by regulatory authorities; however, these standards have generally been based upon the natural coliform densities and reasonably attainable objectives. These allowable coliform densities, expressed as most probable numbers, vary from 50 to 2,400 per 100 ml. Most standards are in the 500 to 1,000 per 100 ml. range (21).

Water used for swimming should be free from obnoxious floating or suspended solids and from objectionable color and odors. The water should be free of pathogenic organisms and substances which are toxic to humans.

Livestock and wildlife watering:

No bacteriological standards for livestock and wildlife watering have been established and the possibility of transmission of disease from man to animal via sewage polluted water has not been completely evaluated.

It has been found that the total salt concentration (in water) that can be tolerated by farm animals is about 15,000 to 17,000 parts per million. For continuous use, much lower concentrations are required. In Colorado, a salinity as high as 2,500 ppm is considered acceptable for stock. In Montana, salt concentrations to 2,500 ppm are considered good, 2,500-4,500 ppm fair to poor, and above 4,500 ppm unfit for use.

Some substances are specifically toxic to animals. Information on the effects of some of the more common toxic compounds is given in Table VII. This table represents only a few of the toxic materials and is intended only to show the relative toxicity of a few of the most common chemicals.

Where livestock or wildlife watering are beneficial downstream water uses, sewage and other wastes should be excluded or treated so that toxic concentration of these wastes will not be present in the streams.

Table VII

Effect of Polluting Materials on Animals and Fowl

(Table developed from information in "Water Quality Criteria," California State Water Pollution Control Board (16).)

Substance	Concentration or Quantity	Time	Animal or Fowl	Effect
Arsenic trioxide	5-100 mg./kg. of bodyweight	-	Laboratory animals	Lethal
	324 mg.	24 hrs.	Chickens	Lethal
Chromium ($K_2Cr_2O_7$)	500 ppm	-	White rats	Maximum non-toxic concentration
	10,000 ppm	-	Rabbits	Marked interference with digestion
Copper	18 to 162.5 grams	-	Sheep	Lethal
	1 gram/lb. of live-weight ($CuSO_4$)	p/day	Cattle	Toxic
Lead	0.5 ppm		Farm animals	Maximum safe concentration
Phenols	5,000 ppm		Rats	No effect
Sodium cyanide[1] (See HCN)	4.15 mg./kg. of body-weight	-	Sheep	Toxic
	5.22 mg./kg. of body-weight	-	Sheep	Lethal
Hydrogen cyanide	103 ppm	-	Cows & ducks	Lethal

---

[1] When NaCN in small quantities is added to water, HCN is formed.

Fish life:

Water quality objectives for this use are generally evaluated in terms of dissolved oxygen content of the waters, concentration of toxic or harmful materials, temperature, and available food supply.

Many complex biological and chemical conditions have made it difficult to establish exact numerical limiting values for the several environmental factors. These conditions include: different species of fish with individual degrees of tolerance to pollution, synergistic effects of natural water minerals and polluting chemicals, time-concentration relationship, and technical difficulties in determining the concentration at which permanent harm to fishlife results. The problem is further complicated by the fact that the number of aquatic organisms that provide food for fish may be reduced by pollution, and thus indirectly decrease the fish population. The characteristics of water that determine its suitability for fish life include*:

Dissolved oxygen	Not less than 5 ppm
pH	6.7 - 8.6
Specific conductance (max)	1000-2000 mhox10^6
Free CO_2	Not over 3 c.c./liter
Ammonia	Not over 1.5 ppm
Suspended solids	Such that the lighting intensity at the 5 meter depth will be at least one millionth of that at the surface.

Other substances including chemicals, oils, and sawdust may also have an adverse effect upon fish life either through an effect upon the foregoing water properties or by direct toxic action. Harmful concentrations of a few of the more common toxic chemicals are shown in Table VIII. This table shows only the relative toxicity of a few of the most common materials.

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* These values represent conditions that are favorable for fish life rather than the minimum conditions under which fish life might exist and are based upon the work of M. M. Ellis. Detection and Measurement of Stream Pollution - Bulletin No. 22 - U. S. Bureau of Fisheries - 1937.

Table VIII

Toxic or Lethal Concentration of Pollutants for Fish and Aquatic Life

(Table developed from information in "Water Quality Criteria," California State Water Pollution Control Board (16).)

Substance	Toxic Concentration
Ammonia	2.5 ppm
Ammonium sulfate	66 ppm
Arsenic Trioxide	10 ppm (2.5 ppm[1])
Potassium Dichromate	5.2 - 20 ppm
Copper	0.015 - 3.0 ppm[1]
Lead	0.1 ppm
Oil (Crude)	0.3 ppm
Phenol	5.0[2] ppm
Suspended sediment	300-750 ppm
Sodium cyanide (NaCN)	0.05[3] ppm
Sulfuric acid	pH at 4.5 - 5.0
Tannic acid	0.4-10 ppm
Tars	20 ppm

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[1] Fish food organisms.
[2] Also imparts bad flavor in fish.
[3] Trout. Five day exposure.

Industrial Water Use

Desirable water quality criteria as related to industrial water uses varies greatly with the type of industry (26 & 27). In the Northwestern Lahontan Basin, the only industrial use made of surface water is in log ponds and gravel washing, hence no specific industrial water quality criteria are indicated in this section. If industrial use of surface water should, in time, develop it will then become necessary to evaluate the water needs of industry with relation to pollution control measures and other beneficial water use.

POLLUTION CONTRIBUTED TO WATERSHED

There are 24 severed communities in the Northwestern Lahontan Basin having a total population of approximately 72,000 (Table 1, Appendix). The population equivalent of the waste from these communities is decreased by treatment to 42,000, 53% of which is discharged to the Truckee River, 5% to the Carson River, none to the Walker River, 1% to the Susan River, and 40% to land (Table IX).

In many of the smaller communities, cesspools, or septic tanks, are used for the disposal of sewage; however, only at Verdi, Nevada, is there indication that underground water is being contaminated. Many of the summer homes and resorts around Lake Tahoe and on the upper reaches of the Truckee River also utilize septic tanks and cesspools. In several of these areas the individual disposal systems frequently allow sewage to overflow thus causing health hazards and nuisances. The settled solids or sludge that accumulate in the bottom of a septic tank contain great numbers of bacteria, some of which are capable of causing diseases. The Lahontan Regional Water Pollution Control Board and the State Health Department of Nevada have worked closely with local agencies in taking precautions against the overflowing septic tanks and encouraging local cesspool pumpers to discharge cesspool wastes safely.

Direct contamination of streams by campers and fishermen is a potential problem in this area. In the regulated camp grounds sanitary facilities are usually provided, but along the river banks and away from the established camps it is the responsibility of the individual to protect the streams from contamination.

A potential contamination hazard lies in the disposal of sanitary wastes from passenger trains. In places, the rights of way are close to the river banks and excreta might be washed into the river.

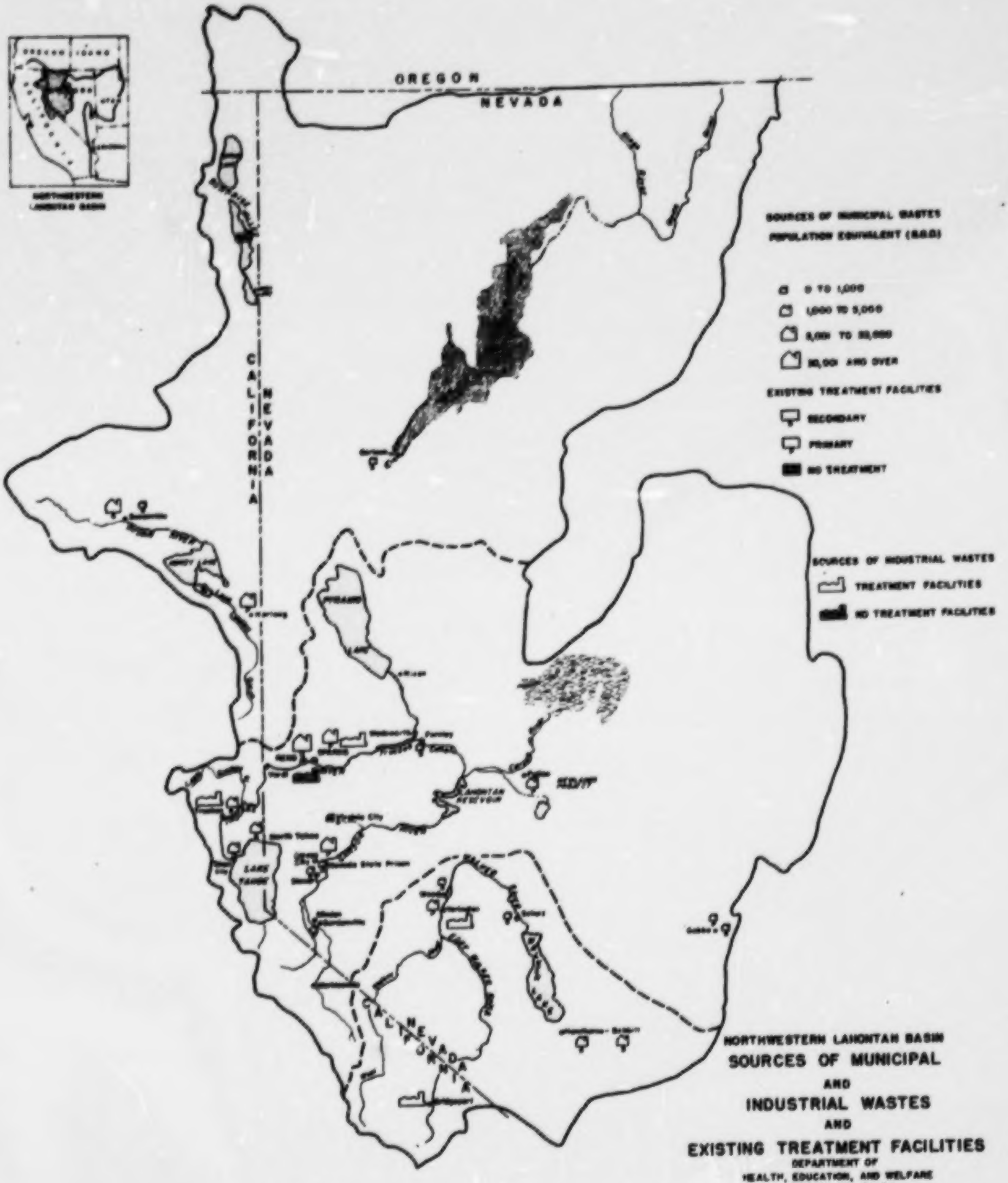
The four or five excursion boats and privately owned cruisers offer a potential source of contamination to the lake. This problem is significant because of the possibility of contaminating some of the many domestic water supplies that are taken directly from the lake. The California Water Pollution Control Authority has worked with the state and local health departments in an effort to correct this problem. The public health significance of toilet installations (heads) on the four or five pleasure craft is being investigated by the California State Department of Public Health and the local health departments. It is expected that more rigid control will be exercised over these boats. At present there are no excursion boats operating from the Nevada shore of Lake Tahoe.

Only five industrial plants have separate sewage outfalls (Table 2, Appendix). With the possible exception of cyanide discharges from the Virginia City area, the only industrial waste that enters the streams is silt from gravel washing activities near Reno. All other industries either pond their waste or discharge it to the municipal sewers.

At Truckee, California, treated industrial waste from the Southern Pacific locomotive service pits is discharged to land. Treatment consists of oil removal by manual skimming and ponding. No wastes reach the river. A similar installation is located at Sparks, Nevada.

A number of sawmills are located in the timbered portion of the basin. These mills are, in general, equipped with sawdust burners, and the disposal of sawdust is not a great problem. The discharge of water from log ponds to streams if uncontrolled and unplanned may cause problems because of its high biochemical oxygen demand and phenol content (Table 9, Appendix).

Soil washed from hillsides is a sediment problem in some localities. During the Comstock era little thought was given to conservation of forests or watersheds, and entire mountain slopes were completely denuded. Many of these early logging areas have eroded badly and large amounts of suspended sediment are still carried by Clear Creek, Carson and Truckee Rivers. In the Virginia City area suspended sediment from mine dumps is washed into the Carson River during periods of high runoff. In other localities poor grazing practices have been the cause of erosion. High suspended sediment burden of rivers damages aquatic life and causes deposition of solids in reservoirs and other irrigation works.


NORTHWESTERN LAHONTAN BASIN
OREGON
NEVADA
CALIFORNIA
NEVADA
LAKE TAHOE
LAHONTAN RESERVOIR
Carson City
WALKER LAKE
CALIFORNIA
NEVADA
SOURCES OF MUNICIPAL WASTES
POPULATION EQUIVALENT (B.O.D.)
0 TO 1,000
1,000 TO 5,000
5,001 TO 20,000
20,001 AND OVER
EXISTING TREATMENT FACILITIES
SECONDARY
PRIMARY
NO TREATMENT
SOURCES OF INDUSTRIAL WASTES
TREATMENT FACILITIES
NO TREATMENT FACILITIES
SCALE IN FEET

NORTHWESTERN LAHONTAN BASIN
SOURCES OF MUNICIPAL
AND
INDUSTRIAL WASTES
AND
EXISTING TREATMENT FACILITIES
DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE
Public Health Service
DIVISION OF WATER POLLUTION
Map No. 3

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Table IX

Domestic Sewage & Effluent from Sewage Treatment Works Discharged to Land Disposal & to Watercourses (In Terms of Population Equivalent) [1]

State	River System Within Northwestern Lahontan Basin							
	Truckee River Discharged to:		Carson River Discharged to:		Walker River Discharged to:		Other [2] Discharged to:	
	Water	Land [3]	Water	Land [3]	Water	Land [3]	Water	Land [3]
California	880	1,780	0	0	0	0	650	4,000
Nevada	21,290	380	2,540	5,861	0	1,530	0	3,390
Sub total	22,170	2,160	2,540	5,861	0	1,530	650	7,390
Total (all river systems)			Water	25,360				
			Land	16,941 [4]				
				42,301 [4], [5]				

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[1] Includes industrial wastes discharged to municipal sewers. Does not include areas in which individual household disposal systems are used.

[2] Includes Susan River, Long Valley Creek, Walker Lake Region, Gabbs Valley, and N.W. Nevada.

[3] Does not include subsurface disposal from individual septic tank installations.

[4] Includes raw sewage discharged to land disposal areas at one community. P.E. 561.

[5] Population equivalent of waste before treatment: 86,400.

DAMAGE TO WATER RESOURCES FROM POLLUTION

Damages to the limited water resources are small because of the high percentage of communities and industries which have installed waste treatment facilities. At only a few points are water uses seriously impaired by pollution.

Surface Water

At Lake Tahoe the potential hazard of contamination of water supplies by sewage discharge from the four or five boats having toilet facilities is a problem which is now under investigation at the request of the California Water Pollution Control Authority, by the state and local health departments. At the completion of this investigation it is expected that the state and local health authorities will resolve some means of permanent correction. At present there are no excursion boats operating from the Nevada shore of Lake Tahoe.

Domestic water supplies at Fernley and Wadsworth, Nevada, are, to some extent, endangered by sewage discharged by cities along the Truckee River, primarily Reno and Sparks. Rural wells near Sparks are occasionally polluted by sewage contaminated flood waters of the river.

At Tahoe State Park, situated about one mile east of Tahoe City on State Route 28, stream contamination resulting from the improper functioning of septic tanks and leaching fields has occurred. As a result of this contamination, this park, one of two on Lake Tahoe, was closed to the public. Soil conditions in this vicinity are not suitable for the use of septic tank sewage disposal systems and it is doubtful if the park will be reopened until a more adequate sewerage system can be provided.

Negotiations are now under way between the State of California, Division of Beaches and Parks, and the Tahoe City Public Utility District, to discharge sewage from the park to the Tahoe City Public Utility District collection system.

Defilement of the many streams by campers and other transient visitors endangers the health of other persons who assume that the water is free of contamination and who may use the river water for drinking or culinary purposes. A closely related problem is that of disposal of cans and other camp debris in and along the rivers and streams.

Another similar problem is the potential contamination of the Truckee River by sewage from railroad trains. This problem stems from the location of a mainline railroad right-of-way along the Truckee River, and of the custom of disposing of sewage from trains directly to the right-of-way.

There have been reports of fish kills due to cyanide in the Carson River below Dayton, Nevada. Chemical analysis has shown that, at times, traces of cyanide can be found in the small stream that drains the Gold Hill-Virginia City district, and which enters the Carson River near Dayton. This cyanide may be due to erosion from old mill dumps or it may be the direct result of milling operations. Cyanide in sufficient concentration can also kill cattle and other livestock.

In some portions of the basin, as discussed in the section of this report on Pollution Contributed to the Watershed, effects of suspended sediment from soil erosion are of significance. Suspended sediment results in impairment of water quality for some beneficial water uses and in the deposition of solids in lakes and reservoirs.

Ground Water

Verdi, Nevada, is the only locality at which ground water contamination is of sufficient magnitude to cause serious trouble. The residents of this small community, which has neither water nor severage systems, have had to develop individual water supply and sewage disposal systems. As a result of several contributing factors--small lots, the use of seepage pits, and the type of well construction used--many of the wells have become badly contaminated.

During the period January 12, 1950, to March 13, 1952, the Nevada State Department of Public Health took 40 water samples from 16 wells located in Verdi. Bacteriological examination (Table X) indicated that most of the wells were badly contaminated with sewage type bacteria.*

Table X

Coliform Densities (Most Probable Numbers) in Water from Wells in Verdi, Nevada

M.P.N./100 ml.	-2.2	2.2	5.1	9.2	16.0	16.0+
No. of Samples in this Range	18	2	4	5	6	5
% of Samples	45	5	10	12.5	15.0	12.5

In January 1951, the Office of the State Engineer, Nevada, in cooperation with the United States Geological Survey, made a survey to determine the probable cause of these polluted wells, and to investigate the feasibility of installing a community well. The report concludes,

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* In a water supply which meets the Public Health Service Drinking Water Standards approximately 90% of the samples will show a coliform density in -2.2/100 ml. range (see Appendix C).

"The main source of the pollution is probably the effluent from the numerous septic tanks, cesspools and outhouses, many of which are less than 100 feet from these wells... It appears, therefore, that conditions are favorable for the development of a community supply of adequate quality from ground water in the alluvium. Conditions are not so favorable for obtaining uncontaminated ground water." (7)

In other areas of the basin in which land disposal of sewage is practiced there have been no reports of polluted or contaminated ground water.

BENEFITS RESULTING FROM POLLUTION PREVENTION AND ABATEMENT

Most of the economic development in this basin is directly dependent on the cleanliness of the lakes and streams. The pollution control measures have, with few exceptions, protected these valuable water resources, and in only a very few instances is water lost to its highest beneficial use. However, if this relationship between pollution and beneficial water use is to remain constant, then pollution control must progress with the development of the country. If pollution control measures are allowed to lag behind the economic development, lake, stream and ground water quality may be so impaired that the economy of the basin will be adversely affected.

The pollution prevention measures that are now in effect have had many readily observable beneficial results. Pollution loading on the Truckee River is such that the Reno-Sparks water is distributed without filtration treatment. Lake Tahoe has been kept sufficiently free of contamination that the water is used, without treatment, for domestic water supply. The use of water for agriculture and livestock watering has not been restricted because of pollution. Almost all of the streams are used for fishing. Fish kills caused by pollution have been very rare. However, with the ever increasing recreational use of the region, and with the continued population growth, the problem of pollution control will become progressively larger but at the same time there will be a larger tax base aiding solution of the problems.

Benefits that will result from pollution control measures are manifold, and include: increased safety for those whose domestic water supply comes from surface sources; increased fishing use for the lower portion of the Truckee River; less chance of water borne disease for those who, through choice or ignorance, drink from the mountain streams; and, perhaps most important, the assurance that the recreational and economic development of the basin may go forward unhindered by polluted water.

The long range water pollution control program initiated by the Regional Water Pollution Control Board of California in cooperation with the state of Nevada and the local health department will permit continued development without adversely affecting the quality of these waters.

At several points in the basin pollution abatement will eliminate, or greatly decrease, health hazards due to drinking or swimming in sewage polluted water. Control of sewage discharge from boats operating on Lake Tahoe will mean that there would be little likelihood of sewage contamination of domestic water supplies taken from the lake. Sewage treatment at Tahoe City will lessen the danger to those who may drink from the Truckee River.

Sewage collection and treatment at Verdi will eliminate the major source of contamination of wells in this area, and end the disease hazards associated with the use of water from sewage contaminated wells.

Pollution abatement at Sparks and Reno will give added safety to downstream residents who obtain domestic water supplies from the Truckee River and the Truckee Canal. Decreased pollution from these two towns will allow fishing use of the river during the summer low flow period and will tend to lessen the fishing pressure on the Truckee above Reno.

At many places in the basin there have been difficulties with poorly designed or overloaded septic tanks. These systems occasionally allow raw or poorly settled sewage to overflow and pond on the surface of the ground. Frequently these mishaps occur during periods of maximum use during the height of the tourist season, hence, in addition to being a public health hazard, also cause considerable annoyance and expense. Where such malfunctioning of septic tanks is a common occurrence, construction of sewers and sewage treatment plants will eliminate the possibility of disease outbreaks caused by sewage carried pathogenic organisms, and the annoyances and nuisances caused by decomposing sewage.

Exclusion of cyanide and other toxic wastes from the surface waters will mean that the water may be used safely for irrigation or livestock watering. It also means that there will be no needless killing of fish or wildlife.

Control of erosion and other sources of suspended sediment decreases maintenance cost of irrigation works and improves the fishing potential of streams. Reduction of suspended sediment in surface water also aids in decreasing the cost of municipal water treatment where surface water is used for this purpose.

POLLUTION PREVENTION MEASURES IN EFFECT

There are 22 sewage treatment plants in the Northwestern Lahontan Basin, serving 23 communities with a total population of 72,693. Including the industrial wastes discharged to community sewers, these plants treat wastes with a population equivalent of about 86,000. Six plants are located in the Truckee River Basin, five in the Carson River Basin, three in the Walker River Basin, three in the Honey Lake Drainage System, and five in other areas of the basin. One severed community has no treatment plant. (Table 1, Appendix, and Table XI.)

There are five major industrial plants with separate wastes outlets, four of which have provided adequate waste treatment facilities. Adequate waste treatment facilities will be provided at the new Anaconda Copper Co. plant at Yerington. (Table 2, Appendix.)

Table XII indicates that 15 of the existing municipal treatment plants in this basin are "adequate" as to capacity and that 14 of these plants are operated satisfactorily. Adequacy as used herein indicates discharges from these facilities classified as satisfactory, have caused no complaints and appear, on the basis of preliminary investigations, to be satisfactory for present conditions. In most cases, however, no special surveys have been made or hearings held as required by California law to determine legally whether "pollution" or "nuisance" is existing or threatened. On the basis of present information eight other plants are considered unsatisfactory as to capacity, and six are considered unsatisfactory as to operation. The adequacy of operation in three plants in California is undetermined.

Table XIII indicates that the four industrial waste treatment plants are adequate both as to capacity and operation.

Table XIV shows that communities in this basin have been quite active in the construction and renovation of existing treatment plants in recent years. This table does not, however, reflect the fact that almost all of the incorporated communities of the basin constructed sewage treatment plants at some time prior to 1948. Neither does it reflect the very active planning that is now going on. If existing plans materialize, 1953 will see the construction of three new sewage treatment plants with a total design capacity of approximately 24,000.

Because of the rapid growth of the summer recreational population on the shores of Lake Tahoe and the inherent problems of providing satisfactory disposals in the topographically rough terrain around much of the lake shore, continued vigilance is necessary by state water pollution control agencies of California and Nevada and by state and local health authorities. These authorities deserve full and continued support by communities, resort and home-owners in contending with this problem.

Communities on the shores of Lake Tahoe that have completed financing of sewage collection and treatment facilities are:

Tahoe City Public Utility District
North Tahoe Public Utility District
South Tahoe Public Utility District.

Susanville Consolidated Sanitary District on the Susan River has likewise completed financing arrangements for sewage treatment works.

Table XI

EXISTING TREATMENT FACILITIES

MUNICIPAL*

Degree of Treatment Provided	Number of Municipalities* Served	Number of Treatment Plants	Population Served
Primary**	9	8	24,131
Secondary	14	14	48,512
No Treatment***	1	-	561

* Includes incorporated or unincorporated municipalities; other legal bodies as sanitary districts, counties, towns; significant institutions, resorts, recreational centers or other population centers.
** Includes one "minor" treatment plant.
*** Municipality with sewers.

Table XII

ADEQUACY OF EXISTING TREATMENT FACILITIES

MUNICIPAL*

Number of Municipal* Treatment Facilities	Adequacy** With Relation To:				
	Capacity		Operation		
	Satisf.	Unsatisf.	Satisf.	Unsatisf.	Undetermined
California	5	1	2	1	3
Nevada	10***	7	12***	5	0
Total	15***	8	14***	6	3

* Includes incorporated or unincorporated municipalities; other legal bodies as sanitary districts, counties, towns; significant institutions, resorts, recreational centers or other population centers.

** "Adequacy," as used here, indicates discharges from those facilities classified as satisfactory have caused no complaints and appear, on the basis of preliminary investigations, to be satisfactory for present conditions. In most cases, however, no special surveys have been made or hearings held as required by California law to determine legally whether "pollution" or "nuisance" is existing or threatened.

*** Includes one town with no treatment.

Table XIII

ADEQUACY OF EXISTING TREATMENT FACILITIES

INDUSTRIAL*

Number of Industrial* Treatment Facilities	Adequacy** With Relation To:				
	Capacity		Operation		
	Satisf.	Unsatisf.	Satisf.	Unsatisf.	Undetermined
California	2	0	2	0	
Nevada	2	0	2	0	
Total	4	0	4	0	

* Industries having separate outlets discharging wastes directly to watercourse.

** "Adequacy," as used here, indicates discharges from those facilities classified as satisfactory have caused no complaints and appear, on the basis of preliminary investigations, to be satisfactory for present conditions. In most cases, however, no special surveys have been made or hearings held as required by California law to determine legally whether "pollution" or "nuisance" is existing or threatened.

Table XIV

PROGRESS IN CONSTRUCTION OF POLLUTION ABATEMENT FACILITIES

Year	Municipal		Industrial	
	Sewage Treatment Plants Completed	Design Population	Waste Treatment Plants Completed	Amount of Waste Treated (In terms of Equiv. No. People)
1948	-	-	-	-
1949	-	-	-	-
1950	2	55,000	-	-
1951	3*	10,000	-	-
1952	2**	1,000	-	-

* One new plant. Two additions.
** Addition to existing plant. One new Plant.

A large body of law related to water pollution control has been developed both in California and Nevada. The more important points of these laws are summarized in the following pages. For additional specific information the California Health and Safety Code (22), the California Water Code (23), and the Nevada Compiled Laws should be consulted.

A. California (24)

Comprehensive and sweeping changes in state laws for the control of water pollution were enacted by the California legislature in 1949. The new laws created a State and nine Regional Water Pollution Control Boards. The state board has been designated as the state water pollution agency for the purposes of the Federal Water Pollution Control Act.

The California statutes define "contamination" as an impairment of the quality of the waters of the state by sewage or industrial waste to a degree which creates an actual hazard to public health, and the responsibility for abatement of contamination is vested in the State Department of Public Health and the local health officers. "Pollution" is defined in the statutes as an impairment of the quality of waters to a degree which adversely and unreasonably affects such waters for beneficial uses, and the responsibility for abatement, prevention, and control of pollution rests with the Water Pollution Control Boards. These boards are also responsible for the abatement and control of "nuisance," which is defined as damage to any community by odors or unsightliness resulting from unreasonable practices in the disposal of sewage or industrial waste.

The 1949 legislation, in creating these Water Pollution Control Boards, had a threefold purpose: First, to provide a means of coordinating the actions of the manifold governmental agencies involved in the prevention and control of water pollution; and secondly, to place the concentration of control on a local or regional level; and third, to separate the health and economic aspects.

The State Water Pollution Control Board, which serves as an advisory and appellate body to the regional boards, is composed of nine members, appointed by the governor and representing designated interests concerned with water pollution, in addition to the following four state officials: Director of Public Health, State Engineer, Director of Natural Resources, and Director of Agriculture.

California is divided into nine water pollution control regions, and the regional boards are vested with the primary enforcement responsibility in relation to pollution and nuisance. These boards are appointed by the governor, and each of the five members represents a designated organization or field. The State Board and each of the Regional Boards appoint an executive officer and technical staff to administer their activities.

The State Department of Public Health, which has authority and responsibility in relation to contamination is under the control of the State Board of Public Health consisting of the Director of Public Health and seven members appointed by the governor.

In California, as in many other states, there are a number of agencies charged with responsibility for enforcing laws relating to water pollution control, and it would appear that the 1949 California legislation has divided this responsibility among several state agencies. However, the California Attorney General in an opinion dated February 7, 1951, has expressed the view that the 1949 legislation has established the State Water Pollution Control Board as the single state agency having ultimate over-all power and responsibility for enforcing state laws relating to water pollution in all parts of the state. It is on this basis that the Surgeon General of the U. S. Public Health Service has designated the State Water Pollution Control Board as the state water pollution agency for California.

The State Water Pollution Control Board is empowered to formulate a state-wide policy for the control of water pollution with due regard for the authority of the Regional Boards. These latter boards are empowered to formulate and adopt long-range plans and policies with respect to water pollution control within their regions.

Prior to 1949, the California Health and Safety Code required that persons or agencies intending to install sewage disposal facilities obtain a permit from the Health Department, which Department reviewed and passed on plans before granting the permits. The new laws have abolished this permit system, and any person now proposing to discharge sewage or industrial waste must file with the appropriate regional water pollution control board a report of the proposed discharge. The regional board, after investigation and any necessary hearings, prescribes requirements as to the nature of the discharge with relation to conditions existing from time to time in the disposal area or receiving waters. In contrast to the powers formerly reposed in the Health Department, the Regional Board may not specify the design, location, type of construction, or particular manner in which a condition of pollution is to be controlled.

The Regional Board may not only request enforcement of water pollution laws by appropriate federal, state, and local agencies, but may also, after adjudication hearings, order correction of pollution or nuisance, either existing or threatened, within its region. Upon failure of any person to comply with orders to correct pollution, the regional board may initiate court action.

Should a regional board fail to take or obtain appropriate action to correct a condition of pollution, then the State Board shall direct that such action be taken or may itself take such action. In so doing, the State Board is vested with the powers granted the Regional Boards. The State Board may also, on finding that a "contamination" exists which is not being corrected, direct that action be taken by any state agency having jurisdiction.

The Department of Public Health or any local health officer may issue a peremptory order requiring the abatement of a contamination and may bring and prosecute an injunction in the courts. Any person who discharges sewage or industrial waste in any manner which results in contamination is guilty of a misdemeanor.

The State Water Pollution Control Board is authorized to administer any state-wide program of research in the technical phases of water pollution control and may accept funds from the federal government or any person for that purpose. The state and regional boards have the power to require any state or local agency to inspect and report on technical factors involved in water pollution, and the regional boards may investigate any source of water pollution or nuisance within their regions. The State Department of Public Works, through its Division of Water Resources, is directed to investigate conditions of the quality of all waters within the state as related to all sources of pollution and must report annually thereon to the Legislature and the Regional Water Pollution Control Boards. This Division also is authorized to conduct investigations relating to reclamation of water from sewage or industrial wastes and to damage to quality of underground water caused by improperly constructed or defective water wells.

One of the primary functions of the Regional Water Pollution Control Boards is to obtain coordinated action in the control of water pollution by means of formal or informal meetings of the persons involved. They are also directed to encourage and assist in self-policing waste disposal programs for industry. The State Board administers any statewide program of financial assistance for water pollution control and may accept federal funds for that purpose. The State Health Department is directed to cooperate with the regional boards by inspecting and reporting on technical factors involved in any condition of pollution or nuisance and may also recommend to the regional boards corrective measures. The California Fish and Game Commission has certain statutory responsibilities in the field of water pollution and is directed to report to and cooperate with the appropriate regional water pollution control board whenever a condition of pollution is found to exist.

In addition to the administrative powers discussed in the foregoing paragraphs, the State Water Pollution Control Board is empowered to adopt reasonable rules and regulations for the conduct of its affairs and to allocate to the Regional Boards funds for the administrative expenses of the Boards. The Regional Boards may recommend to the State Board projects for the reduction of water pollution.

There are no exemptions from the operation of the California Water Pollution Control Act other than the section which states that no provision of the Act shall be construed as affecting the right of any person to the use of water for any beneficial use other than the disposal of sewage and industrial waste. The 1949 legislation provides that the newly enacted laws shall not constitute a limitation on: (a) the power of a city or county to adopt and enforce additional regulations imposing further restrictions with respect to water pollution; (b) the power of any city or county to abate nuisances; (c) the power of a state agency in the enforcement or administration of any provision of law which it is permitted or required to enforce or administer; or (d) the right of any person to maintain at any time appropriate action for relief against any private nuisance as defined in the Civil Code or for relief against any contamination or pollution.

The California State Water Pollution Control Board on January 12, 1950, adopted a preliminary statement of objective and policy which reads in part as follows:

> The objective of the State Water Pollution Control Board is the prevention and control of pollution and contamination of the waters of the state at a minimum of expense consistent with obtaining this objective. In achieving this objective, it will be the policy of this Board that its actions and those of the Regional Water Pollution Control Boards shall be so directed as to secure that degree of care in the planning and operation of works for the treatment and disposal of sewage and industrial wastes as will adequately protect the public health and all of the beneficial uses of waters in this state and at the same time permit the legitimate planned usage of those waters for receiving suitably prepared wastes so that an orderly growth and expansion of cities and industries may be possible.

Although there is no specific provision in the California law for participation of the Water Pollution Control Boards in interstate compacts, by informal agreement the state of Nevada and the Lahontan Regional Water Pollution Control Board enforce pollution control requirements on Lake Tahoe and small interstate streams. Also sections 8000 to 8011 of the Government Code provide for a California Commission on Interstate Cooperation which has broad functions such as aiding in solving any interstate pollution problems.

On the basis of the powers granted to it under this 1949 legislation the Lahontan Regional Water Pollution Control Board on September 25, 1952, established discharge requirements for the Lake Tahoe watershed. This resolution (Appendix B) requires that effluent from sewage treatment plants meets the U. S. Public Health Service drinking water standards.

B. Nevada

In Nevada, the state legislature has vested the water pollution control powers in the State Board of Health. (Chapter 227, Laws of 1949.) Previous legislation dating from 1911 confers upon the State Board of Health general supervision over all matters relating to the preservation of the health of the citizens of the state, including the control of sewage disposal. (Nevada Compiled Laws 1929, 1941, Sup. Sec. 5259.) Other laws included in Nevada statutes make pollution of lakes, rivers, or streams, either generally or by positive specified substances, a criminal or civil offense (N.C.L. 1929, Secs. 5636-38, 8240-41, 8246, 8248-50, 10229, 10230, 10244, and 10552.) The Attorney General, with the consent of the Governor, is charged with the duty of instituting and maintaining actions to prevent or restrain water pollution (N.C.L. 1929, Sec. 8246-47). The County Commissioners may institute and maintain suits against persons depositing sawdust in rivers or streams (N.C.L. 1929, Sec. 8246-47).

An Act of 1947 provides for the formation of sanitary districts and for the issuance and sale of various types of bonds.

Chapter 129, of the 1949 Statutes, revised the revenue bond law for incorporated towns to extend its scope and enlarge the authority in political sub-divisions in order to facilitate the construction and financing of facilities which aid in abating or preventing water pollution by sewage and industrial wastes.

Other Nevada legislation vests in the State Engineer the power to control the drilling of wells, requires that a permit be obtained to drill a water-well, and that a log of the well be filed with the State Engineer.

Nevada, like California, has for many years recognized the value of Lake Tahoe and the Truckee River as a recreational area and as an important source of domestic water supply and has attempted to maintain a high degree of sanitation at the resorts and private residences bordering on the lake and the upper reaches of the river system. On March 29, 1949, the state of Nevada approved Chapter 306 of the 1949 Statutes. The seven sections of this act are as follows:

> "An Act to protect the public health; to preserve from contamination the waters of the Lake Tahoe watershed, defining that watershed; to control the collection and disposal of sewage and other wastes; to protect domestic water supplies, their development, treatment and distribution; requiring a written permit from the State Health Department for any such construction; authorizing the State Board of Health to adopt, amend, promulgate and enforce reasonable rules and regulations governing sewage disposal and domestic water supplies in the Lake Tahoe watershed, and providing penalties for the violation of this act.
>
> "The People of the State of Nevada, represented in Senate and Assembly, do enact as follows:
>
> "Section 1. It shall be unlawful for any person, firm, association or corporation to construct a dwelling, building for human occupancy, or for commercial purposes; a system for the procurement or distribution of drinking water; or a system for the collection or disposal of sewage or other wastes in any of that

portion of Nevada from which water drains into Lake Tahoe, hereinafter designated as the 'Lake Tahoe Watershed,' without first having secured written permission from the Division of Public Health Engineering of the Nevada State Department of Health, hereinafter referred to as the State Health Department; provided, no such permit shall be required for that construction not requiring domestic water or a means of sewage disposal.

"Such permit shall be denied when the source of domestic water or the place of disposal of sewage or other wastes would create a health hazard.

"Section 2. The direct discharge of sewage or other wastes into Lake Tahoe, or within one hundred feet of the established high water rim of Lake Tahoe, or within one hundred feet of a stream, reservoir, spring, well or other water supply in the Lake Tahoe watershed is prohibited; excepting in that instance where disposal of sewage or other waste by reason of property characteristics, topography, or other limitations cannot be provided other than within one hundred feet of Lake Tahoe, then the State Health Department shall issue the required permit subject to installation and operation of such sewage works as may be necessary to provide protection to the Lake Tahoe water and watershed.

"Section 3. The State Board of Health is authorized to adopt, amend, promulgate, and enforce reasonable rules and regulations consistent with law governing the Lake Tahoe watershed area to carry out the purpose and intent of this act, and shall have the right and authority to enter on any property within the Lake Tahoe watershed area, for the purpose of inspecting said premises to determine whether or not the same are in conformity with the provisions of this act.

"Section 4. Nothing in this act shall be construed as authorizing or permitting by this act, rules or regulations, or the permit authorized thereunder, the discharge of sewage, other wastes, effluents, or other offensive material, into the waters of Lake Tahoe or the Lake Tahoe watershed.

"Section 5. Any person, firm, association or corporation violating any of the provisions of this act or of the rules and regulations hereby established shall be deemed guilty of a misdemeanor and upon conviction thereof shall be punished by a fine of not to exceed five hundred ($500) dollars, or by imprisonment for a period of not to exceed three (3) months, or by both fine and imprisonment.

"Section 6. All acts or parts of acts in conflict herewith are hereby repealed.

"Section 7. This act shall be in full force and effect on and after the day of its adoption."

C. Federal

In 1948, the Federal Water Pollution Control Act, Public Law 845, was enacted (80th Congress as amended by Public Law 519, 82nd Congress). This law declared it to be "the policy of Congress to recognize, preserve, and protect the primary responsibilities and rights of the states in controlling water pollution..." and further provided that where pollution problems are of an interstate nature, the Surgeon General, with the approval of the state water pollution control agencies, may investigate pollution problems, hold public hearings, and, if necessary, institute action in the Federal courts. This law has other provisions including the adoption of comprehensive programs for the control of water pollution.

POLLUTION PREVENTION OBJECTIVES

Additional severage works are needed at several cities and recreational areas to protect the limited water resources from pollution or contamination. These needs are analyzed in the following paragraphs.

Tables XV and XVI summarize the total needs for municipal and industrial waste treatment construction in the Northwestern Lahontan Basin. These tables indicate that there are 15 municipalities that need new, enlarged, or replacement of, sewage treatment plants and that one industrial waste treatment plant is needed.

Table XVII indicates that nine of the municipalities are actively planning for the construction of municipal sewage treatment works. It also shows that five municipalities in Nevada have made no plans for the construction of needed sewage treatment works.

Table XVIII indicates that one industrial waste treatment plant is under construction, and that one industry has made no plan for constructing treatment works.

Table XIX and Map No. 4 indicate the specific municipalities and industries which need waste treatment facilities. The cost of constructing these facilities is estimated to be in excess of one million dollars.

Table XV

WASTE TREATMENT NEEDS - MUNICIPAL*

Needs	Number Calif.	Number Nev.	Population Served by Facilities Calif.	Population Served by Facilities Nev.
New plant	3	4	8,870	2,170
Enlargement or additions to existing plant	0	3	0	5,057
Replace existing plant	0	5**	0	12,862
No project required	5	9	14,550	38,535

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* Includes incorporated or unincorporated municipalities; other legal bodies as sanitary districts, counties, towns: significant institutions, resorts, recreational centers or other population centers.

** One plant serves two towns.

Table XVI

WASTE TREATMENT NEEDS - INDUSTRIAL*

Needs	Number Calif.	Nev.	Total
New treatment plant or other pollution control measures	0	1	1

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* Industries having separate outlets discharging wastes directly to watercourse. Does not include sawmills.

Table XVII

CURRENT STATUS OF MUNICIPAL* ACTION ON POLLUTION ABATEMENT NEEDS

Status of Action	Number of Municipalities* Calif.	Nev.	Total
Inactive	0	5**	5
Active planning	3	6	9
Under construction	0	0	0

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* Includes incorporated or unincorporated municipalities; other legal bodies as sanitary districts, counties, towns; significant institutions, resorts, recreational centers or other population centers, needing treatment works.

** One plant serves two towns.

Table XVIII

CURRENT STATUS OF INDUSTRIAL* ACTION ON POLLUTION ABATEMENT NEEDS

Status of Action	Number of Industries* Calif.	Nev.	Total
Inactive	0	1	1
Under construction	0	1	1

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* Industries having separate outlets discharging wastes directly to watercourse, and needing treatment works.

Table XIX

MUNICIPALITIES AND INDUSTRIES NEEDING IMPROVEMENTS FOR ABATEMENT OF POLLUTION, CONTAMINATION AND/OR NUISANCE

Name and Location	Population Served	Improvements Needed	Remarks
		CALIFORNIA	
South Tahoe P.U.D., Calif. (Near Stateline)	6,620	Sewer system and treatment plant. 1/	Bond voted ($260,000 2/)
Tahoe City P.U.D., Calif.	2,000	Treatment plant and collection system. 1/	Bond voted ($126,000)
Bridgeport P.U.D., Calif. 3/	250	Sewers and sewage treatment plant. 1/	Planning
Tahoe Vista, Calif.	100E 5/	Sewer extension. 1/	Planning
Brockway, Calif.	400E	Sewers and sewage disposal system or connection to N. Tahoe P.U.D. 1/	Planning
		NEVADA	
Crystal Bay, Nevada	820 3/	Sewers and sewage treatment.	Planning
Stateline, Nevada	730 3/	Sewers and sewage treatment.	Planning (See So. Tahoe P.U.D., Calif.)
Verdi, Nevada	420	Sewer and sewage treatment.	Inactive (Est. cost $35,000)
Sparks, Nevada	8,170	Replacement of existing plant and sewer improvement.	(Active planning. Est. cost $415,000)

1/ Needs are based upon public health hazard and/or nuisance conditions.

2/ A consulting engineering firm is now designing a sewage collection system and primary treatment plant. Effluent will be discharged into 10 acres of percolation beds. This system will also take in sewage from Stateline, Nevada. Design population is 8,000.

3/ A community sewer system and treatment facilities have been provided since preparation of this report.

4/ Also a large summer tourist population.

5/ E - Estimated.

Table XIX (continued)

Name and Location	Population Served	Improvements Needed	Remarks
Gabbs, Nevada	200	New plant and sewers.	Inactive
Minden) Gardnerville) Nev.	810	Replace existing plant.	Inactive. (Est. cost $28,000)
Yerington, Nev.	1,182	Replace existing plant.	Planning
Hawthorne, Nev.	1,600	Addition to plant.	Inactive
Carson City, Nevada	3,069	Addition to plant.	Planning. (Est. cost $26,000)
Nevada State Prison (Carson City, Nev.)	388	Repair oxidation lagoons.	Inactive
Fallon, Nevada	2,700	Replace existing plant.	Planning. (Est. cost $158,000*)
		Industrial	
Readymix Concrete Co., Reno, Nevada		Sedimentation.	Inactive

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* Plant only. Sewers and outfall about $130,000 additional. Engineers' estimate.

The following is a summary of the waste treatment needs of the individual communities:

Lake Tahoe - Truckee River System

Crystal Bay Sanitary District, Nevada

This District, estimated population 820, does not have a sewer system and overflowing septic tanks have caused many complaints. To solve these nuisance and public health problems the District should construct a sewer system and an adequate sewage treatment plant, including secondary treatment. The great recreational value of these Lake Tahoe beaches and the Truckee River makes it necessary for the water pollution control authorities of both states to encourage land disposal of sewage. This District is now in the process of negotiating with the North Tahoe Public Utility District (California) for the disposal of sewage from the proposed Crystal Bay Sanitary District sewer into the North Tahoe Public Utility District sewage disposal plant.

Stateline, Nevada

This community, estimated population 730, has also suffered from overflowing septic tanks. To eliminate nuisance conditions and health hazards, this area is forming a sanitary district, and will probably contract with the South Tahoe Public Utility District (California) for treatment of wastes in the South Tahoe Public Utility District proposed sewage treatment plant.

Al Tahoe, California

A small community located south of the South Tahoe Public Utility District, having individual disposal systems. These systems have been generally unsatisfactory during peak tourist seasons. Corrective measures have been made within the past two years, due to increased activities of the Regional Water Pollution Control Board and local agency.

Bijou, California

This area has had difficulties for some time due to malfunctioning individual sewage disposal systems, offering serious pollution and nuisance problems. The community has formed the South Tahoe Public Utility District, voted bonds, and is now in the process of taking corrective measures by constructing a collection system and treatment plant. In addition, the District is contracting with the adjacent community of Stateline, in Nevada, to receive their sewage into the South Tahoe Public Utility District system. The system is so designed to receive sewage from Al Tahoe when the need arises. The sewage effluent from these facilities will be to land disposal.

North Tahoe Public Utility District (Kings Beach)

Have financed a sewage collection system which is now in operation. This District is now in the process of negotiating with the Crystal Bay area, across the Nevada Line, to contract for receiving sewage from Crystal Bay.

Tahoe City, California

At Tahoe City (estimated summer daily peak population 2,000) septic tank effluent enters Lake Tahoe near the outlet control structure at the beginning of the Truckee River. This condition is due largely to a hardpan formation that makes a satisfactory operation of disposal fields almost impossible. Emergency precautions have been taken by the community to chlorinate the sewage effluent which overflows into the lake. This equipment was installed at the request of the state and local health departments, and should control the conditions until more permanent installations have been constructed. To eliminate the public health hazard caused by this sewage, an adequate collection system and sewage treatment plant is being provided. Effluent will be disposed of on land (using overhead sprinklers during the summer and underground leaching trenches in the winter).

Tahoe Vista, California

This community, two miles west of King's Beach, is partially included in the North Tahoe Public Utility District. In the area served by the District there are no sewage disposal problems. However, outside of the District occasional overflowing of sewage from individual septic tanks occurs. To eliminate public health hazards and nuisances sewers should be extended to the rest of the community.

Brockway, California

At Brockway, the principal sewage disposal problems are those of Cal-Vada Resort and Brockway Hot Springs and Resort. At Brockway Hot Springs Hotel sewage occasionally overflows or seeps from the cesspools into the lake. To prevent nuisance conditions and public health hazards, plans are now being made to connect this area onto the North Tahoe Public Utility District sewer system.

Unincorporated Residential Areas

In a region such as this, where there are literally thousands of septic tanks, the disposal of sludge pumped from these tanks may become a real problem. To prevent contamination of the water supplies and health hazards occasioned by dumping of septic tank sludge, local administrative control has been encouraged by the Nevada State Department of Health and the Lahontan Regional Water Pollution Control Board of California, to discharge pumped septic tank wastes into public sewer systems, or into other authorized safe disposal areas.

Discharge of sewage from four or five boats on Lake Tahoe is a dangerous practice. Approximately 15 percent of the domestic water supplies are obtained directly from the lake. These water intakes are, in most instances, located some distance offshore where the water is usually free from contamination. However, boats which have flush type toilets can contaminate these supplies. As previously indicated the California state and local health departments are currently taking steps for more rigid control of the discharge of wastes from pleasure craft operating on Lake Tahoe. At present no excursion boats are operating from the Nevada shore of Lake Tahoe.

Truckee River

Truckee, California

Sewage disposal at Truckee, California, although generally satisfactory at the present time has, in the past, been troublesome.

The sewage treatment plant constructed in 1929 to replace the septic tank and small privately owned sewer systems then in use was, for financial reasons, never entirely completed. Originally it was planned to install a secondary treatment plant, Imhoff tank, trickling filter, and final clarifier with effluent discharged to percolation beds. However, the plant as built had only an Imhoff tank with effluent discharged to percolation beds on the bank of the river. Plant maintenance and operation was sporadic and frequently unsatisfactory.

As a result of these forced economies considerable trouble was experienced with the sewer system and the sewage treatment plant. Raw sewage leaked into the Truckee River from the trunk sewer line which crosses the river on a trestle and from the Imhoff tank, and effluent overflowed into the river from the percolation beds.

In 1950 as a result of an increase in the assessed valuation of the Truckee Sanitary District the treatment plant and a section of the trunk sewers were renovated. The vitrified clay pipe river crossing was replaced with lead-joint cast iron pipe; the leaks in the Imhoff tank were repaired. In 1951 additional percolation beds were constructed.

Under dry weather conditions the system is satisfactory with no overflow from the percolation beds to the river. However, during periods of wet weather and snow melt, when sewage flows of more than 600 gallons per capita per day have been reported, there is probably some overflow from the treatment plant and from sewer manholes which reaches the river. Bacteriological examinations of the river water, made during the spring run-off, do not show a significant increase in the coliform density.

Verdi, Nevada

At Verdi, the ground water is heavily polluted and many wells are contaminated. This community needs both municipal water and sewerage systems. If sewers are installed, treatment facilities should be provided which would completely exclude the sewage effluent from the Truckee River.

Reno, Nevada

At Reno, population 32,378, a two-stage biofiltration treatment plant was built in 1950. Unfortunately, only a few operating control tests are run with the result that the treatment plant removes only about 70 percent of the organic matter as compared with a possible 90 percent removal. Adequate laboratory equipment should be obtained and the necessary control tests run to realize the full potentialities of the plant. The Nevada State Board of Health has specified that the effluent from this plant shall, at all times, contain at least four p.p.m. of dissolved oxygen and that the suspended solids and 5-day BOD shall each be not over 20 p.p.m. To support fish life, the Nevada Fish and Game Commission has recommended that a minimum of six p.p.m. of dissolved oxygen be maintained in the receiving water.

Sparks, Nevada

Sparks, population 8,170, has a dilapidated, badly overloaded primary treatment plant that was constructed in 1930. Sampling has shown that this plant now removes only a very small percentage of the organic matter from the sewage. The residents of Sparks have recognized that this condition, further aggravated by the population influx resulting from the reactivation of Stead Air Force Base, was no longer tolerable and engaged a consulting engineer to design a new sewage treatment plant.

This construction will be financed by a $353,000 bond issue, and by a $62,000 grant (contingent upon approval of the bond issue) from the Federal government under Public Law 139.*

The Nevada State Board of Health specifies that the effluent from this plant shall have, at all times, at least four p.p.m. of dissolved oxygen and shall contain less than 20 p.p.m. of suspended solids and 5-day BOD. To support fish life, the Nevada Fish and Game Commission has recommended that a minimum of six p.p.m. of dissolved oxygen be maintained in the receiving water.

Carson River

Minden and Gardnerville, Nevada

At the twin cities of Minden and Gardnerville, population 810, the primary treatment provided is no longer satisfactory. To eliminate public health hazards and nuisances this plant should be replaced. The degree of treatment should be such that the dissolved oxygen content of the river will not be reduced below the six p.p.m. needed to support fish life,** or, in other ways, adversely affect downstream water uses.

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* Public Law 139 is an act designed to aid communities which have been seriously affected by the defense effort and which are financially unable to construct community facilities needed to support this effort.

** Recommendation of the Nevada Fish and Game Commission.

Carson City, Nevada

Carson City, population 3,069, has an overloaded primary treatment plant, the effluent from which is used for broad irrigation of pasture land adjacent to the treatment plant and the Nevada State Prison. Some additional sedimentation capacity and sludge digestion capacity is needed.

Nevada State Prison, Nevada

The prison has a secondary treatment plant that is generally satisfactory; however, repairs to the oxidation lagoon retaining walls are badly needed.

Fallon, Nevada

Fallon, population 2,393, has an overloaded primary treatment plant. An adequate primary plant is needed to eliminate nuisance conditions and health hazards. The present plan for construction of a new sewage treatment plant and additional sewers should be carried out as soon as is practical.

Walker River

Bridgeport, California*

In Bridgeport, population 250, the individual sewage disposal systems frequently overflow because of high ground water. A community sewer system and treatment plant are needed. Effluent from such a treatment plant should not adversely affect downstream water uses.

Yerington, Nevada

Yerington, population 1,182, has an outmoded, inadequate primary treatment plant that should be replaced to eliminate health hazard and nuisance conditions.

The population influx which is expected as a result of the Anaconda Copper Company plant will further magnify this condition.

Hawthorne, Nevada

Hawthorne, population 1,600, has the equivalent of secondary sewage treatment by reason of percolation of primary treatment plant effluent on the land. To eliminate public health hazards and nuisance conditions in the vicinity of the percolation beds, some additions to the plant are necessary.

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* A community sewer system and treatment facilities have been provided since preparation of this report.

Gabbs, Nevada

To eliminate public health hazards and nuisance conditions, this community should construct an adequate sewage collection system and a secondary sewage treatment plant.

Susan River

The prime water uses of the Susan River are for irrigation and livestock watering. Uses for industry, fishing, and water fowl propagation are of secondary importance.

Susanville

The city of Susanville is sewered by the Susanville Consolidated Sanitary District. The District serves the contiguous area around Susanville. Treated sewage is returned to the Susan River. There are no discharges to the Susan River or its tributaries that cause any serious problem.

Industrial Pollution

The only known sources of industrial pollution are from the gravel washing plant at Reno, and from mining and milling operations in the vicinity of Virginia City. At the Reno gravel washing plant, some provision should be made to decrease the turbidity of the wash water before it is returned to the river. Stream samples taken from the small stream that drains the Virginia City mining area have at times shown traces of cyanide indicating that the ponding methods of the various mills were not entirely effective. Operating mills should be cautioned that cyanide in minute quantities is toxic to livestock, and to fish and wildlife, and they should be urged to maintain their lagoons so that no cyanide wastes will escape.

Analysis of water from sawmill log ponds has indicated that they contain appreciable amounts of phenols and have a high biochemical oxygen demand (Table 8, Appendix). Promiscuous dumping of sawmill pond waste into rivers during periods of low flow could reduce the dissolved oxygen of the stream to a point where fish are killed. Minute concentration of phenols may cause extremely bad tastes in municipal water supplies. Because of these adverse effects care should be exercised in the discharge of waste water from sawmill ponds into streams. It is desirable that these wastes be lagooned or otherwise treated before they are discharged, and then should be discharged only during periods of high runoff.

Where suspended sediment is a major cause of pollution, appropriate erosion control measures should be taken. These measures include: proper farming methods, good range management, sound logging practices, control and stabilization of mine tailings dumps, and adequate fire protection for the forest and rangeland.

Control of New Sources of Industrial Pollution

In California, the Lahontan Regional Water Pollution Control Board, with executive offices located at Bishop, is empowered to establish discharge requirements for waste from any new or existing industries in the California portion of the basin (14 and 23). These requirements would be based upon the downstream water use, and upon the Board's evaluation of the effect of the proposed discharges on the downstream uses. A similar procedure would be followed if ground waters rather than surface waters were involved.

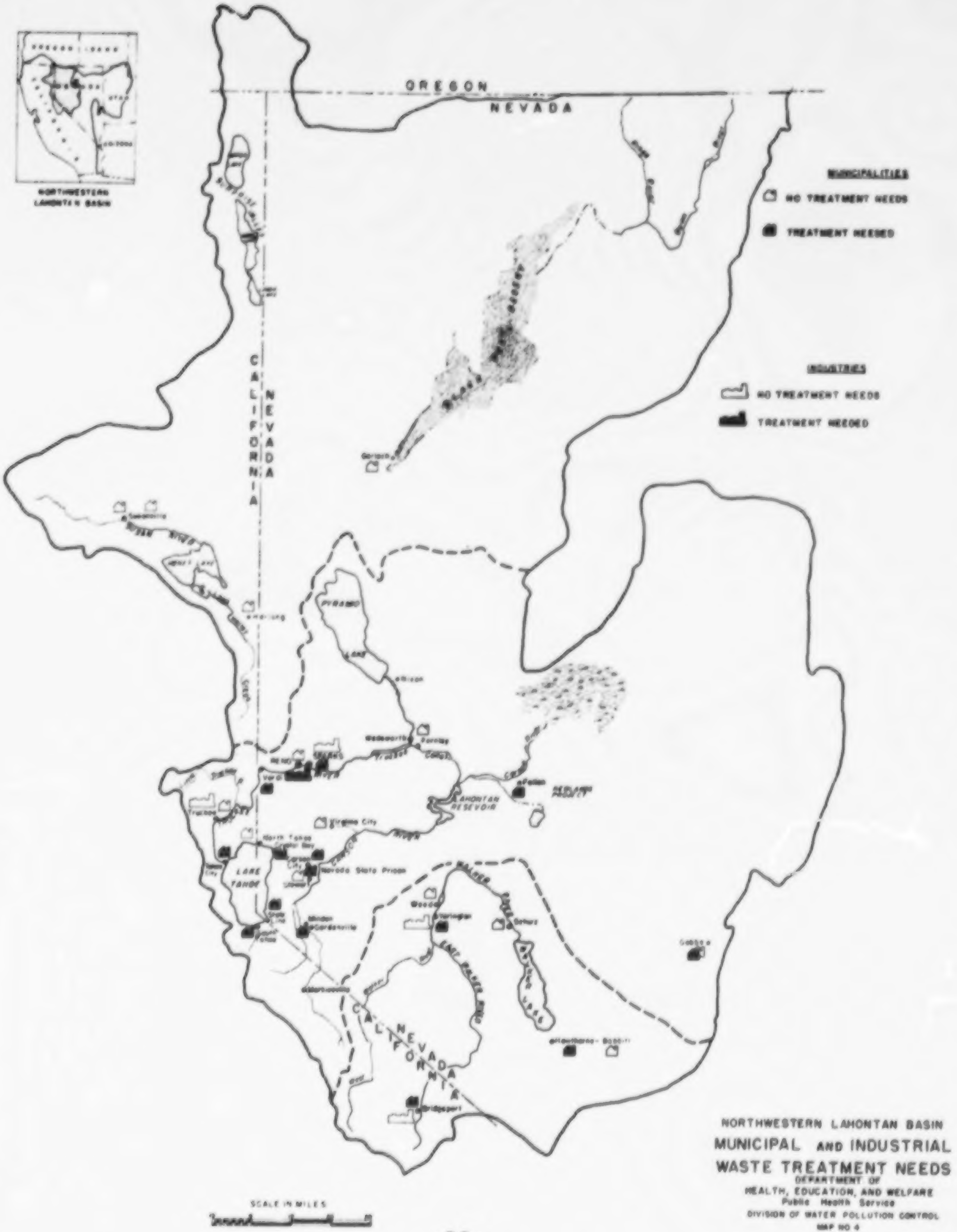
In Nevada, control of industrial waste discharges is based upon a five point plan:

1. Determination of the quality and quantity of wastes.
2. Evaluation of damage that may occur to surface and/or ground water.
3. Reduction in the quantity and strength of the wastes by good plant housekeeping.
4. Satisfactory treatment of remaining waste.
5. Approval of plans and specifications for treatment works by the Division of Public Health Engineering of the Nevada State Department of Health.

Pollution arising from mining activity in the vicinity of Virginia City has not been thoroughly investigated because of the present inactivity of the mines. When these mines resume production, the effect on the Carson River should be evaluated with reference to the downstream beneficial water uses.

Other Sources of Pollution or Contamination

To many of the three million or more persons who visit this region annually, it is axiomatic that running water purifies itself; hence many consider it perfectly safe to drink from the clear, apparently clean, mountain streams. Control of pollution and contamination of the streams by campers and other transient visitors would do much to eliminate the hazard of waterborne disease to those who may drink from the streams. Obviously, control of this type of pollution cannot be obtained by legislation, but must, instead, be developed by an educational program aimed at those who fish, hunt, camp, and travel along the mountain streams and lakes.


NORTHWESTERN LAHONTAN BASIN
OREGON
NEVADA
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MUNICIPALITIES
NO TREATMENT NEEDS
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INDUSTRIES
NO TREATMENT NEEDS
TREATMENT NEEDED
PYRAMID LAKE
Truckee
Reno
Sparks
Verdi
LAHONTAN RESEVOIR
Fallon
Virginia City
North Tahoe
Crystal Bay
LAKE TAHOE
Carson City
Nevada State Prison
Minden
Gardnerville
Weed
Yerington
Schurz
Hawthorne - Babbitt
Bridgeport
CALIFORNIA
NEVADA
SCALE IN MILES

NORTHWESTERN LAHONTAN BASIN

MUNICIPAL AND INDUSTRIAL
WASTE TREATMENT NEEDS

DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE
Public Health Service
DIVISION OF WATER POLLUTION CONTROL
MAP NO 4

Legislative Needs

In general, the pollution control laws of the two states are quite adequate. However, in Nevada this legislation is not consolidated into a single pollution control law, but is instead composed of many specific acts scattered throughout the Nevada Statutes. The Division of Public Health Engineering of the Nevada State Department of Health has prepared a set of regulations based upon the legislative authority for water pollution control in Nevada. These proposed regulations would simplify the administration of pollution control activities. To insure that the limited water resources of Nevada are adequately protected from the damaging effects of pollution, the Nevada State Board of Health should adopt these regulations.

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APPENDIXES

NORTHWESTERN LAHONTAN
WATER POLLUTION CONTROL REPORT

TABLE OF CONTENTS

Appendix A

Table No. Page

1 Basic Data on Sources of Municipal Waste Discharge 1

2 Basic Data on Sources of Industrial Waste Discharge 5

3 Areal Distribution 6

4 Climatological Data 7

5 Hydrologic Data 8

6 Irrigated Land, Acreage 11

7 Principal Storage Reservoirs 12

8 Analysis of Water from Hirshdale Sawmill Pond 13

9 Bacteriological Quality of Water, Nevada Shore of Lake Tahoe . 14

10 Bacteriological Quality of Water, California Shore of Lake Tahoe 15

11 Results of Bacteriological and Dissolved Oxygen Determination, Truckee River, California Portion 16

12 Results of Bacteriological, Dissolved Oxygen, and Turbidity Determination, Truckee, Walker and Carson Rivers, Nevada Portion 18

13 Chemical Analysis of Water, Walker River, Nevada 20

14 Chemical Analysis of Water, Carson and Truckee Rivers 21

15 Water Analysis from Nevada Cities and Towns 22

16 Summary of Public Water Supply Information 24

Appendix B

Resolution 52-3, Lahontan Regional Water Pollution Control Board 25

Appendix C

Section 3.2, Public Health Service Drinking Water Standards 27

A-1-2

TABLE 1

BASIC DATA ON SOURCES OF MUNICIPAL* WASTE DISCHARGE

NORTHWESTERN LAHONTAN BASIN

Name and Location	Estimated River Mile	Population Served	P.E. of Wastes**	Waste Treatment	Adequacy of Treatment Facilities*** Cap'y	Adequacy of Treatment Facilities*** Opr.	P.E. Disch'd [9/]	Treatment Needs	Municipal Action
Honey Lake									
Susan River									
1.Susanville, Calif. Consolidated San. Dist.	23	5,300	6,000	Secondary	Sat.	-	600E	None	-
2.Susanville Fruit Growers Supply Co.		500	500	Secondary	Sat.	-	50E	None	-
Long Valley Creek									
3.Sierra Ordnance Depot (near Herlong, Calif.)	-	6,000E	6,000	Primary	Sat.	-	4,000E (L)	None	-
Truckee River									
Lake Tahoe									
4.No. Tahoe P.U.D. (Calif.)	-	1,500[1/]	1,500	Secondary[2/]	Sat.	Sat.	970E[2/] (L)	None	-
5.Crystal Bay, Nev.	-	820[1/]	920	Individual	Unsat.	-	None	Col. & Treatment	Act. Plan.
6.State Line, Nev.	-	730[1/]	730	Individual	Unsat.	-	None	Col. & Treatment	Act. Plan.
7.South Tahoe P.U.D. (Calif.)	-	6,620[1/]	6,620	Individual	Unsat.	-	None	Col. & Treatment	Act. Plan.

TABLE 1 (Continued)

Name and Location	Estimated River Mile	Population Served	P.E. of Wastes**	Waste Treatment	Adequacy of Treatment Facilities***		P.E. Disch'd	Treatment Needs	Municipal Action
					Cap'y	Opr.			
8.Tahoe City P.U.D., Calif.	107	2,000[1]	2,000[1]	Minor	Unsat.	Unsat.	880E	Col. & Treatment	Bond issue voted
9.Truckee San. Dist. Calif.	96	1,250[2]	1,250	Secondary	Sat.	Sat.	810E(L)[2]	None	-
10.Verdi, Nevada	64	420	420	Individual	Unsat.	Unsat.	None	Col. & Treatment	Inactive
11.Reno, Nevada	50	32,378	41,000E	Secondary	Sat.	Unsat.	13,120E	None	-
12.Sparks, Nevada	47	8,170	9,450E	Primary	Unsat.	Unsat.	8,170A	Replacement	Act. Plan.
13.Fernley, Nevada	[7]	566	566	Secondary	Sat.	Sat.	380E(L)[6]	None	-
			Truckee River ends in Pyramid Lake						
Carson River East Fork Carson R. enters									
14.Stewart, Nev. [7]	87	500E	500E	Secondary	Sat.	Sat.	500E(L)	None	-
15.Carson City, Nev.[7]	85	3,069	6,000E	Primary	Unsat.	Sat.	4,800E(L)[3]	Addition	Planning
16.Nevada State Prison, Carson City [7]	85	388	388	Secondary	Sat.	Sat.	20E	Repair oxidation lagoons	Inactive
Unnamed Tributary Enters [8]									
17.Fallon, Nevada[10]	12	2,700	2,400A	Primary	Unsat.	Sat.	1,900A	Replacement	Planning

Unnamed Tributary [8]									
18.Virginia City	8	561[4]	561	None	Sat.	Sat.	561(L) [6] [1]	None	-
East Fork Carson River									
19.Minden) 20.Gardnerville) Nev.	3	810	810	Primary	Unsat.	Sat.	620E	Replacement	Inactive
				Carson River ends in Carson Sink					
Walker River									
21.Bridgeport, Calif.	112	250[4]	250	Individual	Unsat.	-	None	Sewage system & treatment plant	Planning
22.Yerington, Nevada	38	1,182	1,182	Primary	Unsat.	Unsat.	900(L)	Replace	Planning
23.Schurz, Nevada	9	200	200	Secondary	Sat.	Sat.	130(L)	None	-
24.Weed, Nevada	[7]	750	750	Secondary	Sat.	Sat.	500(L)	None	-
Walker Lake									
25.Babbitt, Nevada	-	3,000	3,000	Secondary[2]	Sat.	Sat.	2,000(L)	None	-
26.Hawthorne, Nevada	-	1,600	1,600	Secondary[2]	Unsat.	Unsat.	1,060(L)	Addition	Inactive
				Walker River ends in Walker Lake					
27.Empire, Nevada[5]	-	300	300	Secondary	Sat.	Sat.	100(L)	None	-
28.Gabbs, Nevada (Basic Refractories, Inc.)	-	280	280	Secondary	Sat.	Sat.	90(L)	None	-
29.Gabbs, Nevada	-	200	200	Primary	Unsat.	Unsat.	140(L)	New Plant	Inactive

Footnotes, Table 1

* Includes incorporated or unincorporated municipalities; other legal bodies as sanitary districts, counties, towns; significant institutions, resorts, recreational centers or other population centers.

** Includes industrial wastes discharged into municipal sewerage systems.

*** "Adequacy," as used here, indicates discharges from those facilities classified as satisfactory have caused no complaints and appear, on the basis of preliminary investigations, to be satisfactory for present conditions. In most cases, however, no special surveys have been made or hearings held as required by California law to determine legally whether "pollution" or "nuisance" is existing or threatened.

1/ Population estimates are based on July-August population (10). In addition, there is a transient population that may not be adequately reflected in these figures.

2/ Primary treatment with controlled land disposal of effluent.

3/ Plant effluent used for irrigation of pasture land. Only a small percentage of the wastes reach the river.

4/ Also a large summer transient tourist population.

5/ Located near Gerlach, Nevada.

6/ Raw sewage discharged to land.

7/ Not actually located on the Carson River.

8/ Enters the Carson River at Dayton.

9/ E = Estimated
A = Measured
L = Land disposal

10/ Discharge to New River drain which flows to Stillwater Reservoir.

TABLE 2

BASIC DATA ON SOURCES OF INDUSTRIAL* WASTE DISCHARGE

NORTHWESTERN LAHONTAN BASIN

Name and Location	River Mi. Abv. Mouth Outlet St	Type Industry	Type Waste Produced	Treatment or Other Pollution Control Measures: Degree	Adequacy*** Cap'y	Adequacy*** Opr.	P.E. Disch'd	Pollution Abatement Needs	Current Status Industrial* Action
Truckee River									
1.SPRR, Truckee, Cal.	64	Misc.	Inorganic	Ponded	Sat.	Sat.	None	None	-
2.Readymix Concrete Co. Reno, Nevada	50	Gravel washing	Inorganic	None	-	-	-	Sedimentation	Planning
3.SPRR, Sparks, Nev.	47	Misc.	Organic & Inorganic	Substantial	Sat.	Sat.	Unknown	None	-
Walker River									
4.Masonic Milling Co. Nr. Bridgeport, Cal.	-	Mining	Cyanide process gold mining	Complete	Sat.	Sat.	None	None	-
5.Anaconda Copper Co. Yerington, Nev.**	38	Mining	Inorganic	Ponded	-	-	-	-	Active
6.Peoples Market, Yerington, Nev.	38	Slaughter-house	Organic	Ponded	Sat.	Sat.	None	None	-

* Industries having separate outlets and discharging wastes directly to watercourse.

** Plant not yet operating.

*** "Adequacy," as used here, indicates discharges from those facilities classified as satisfactory have caused no complaints and appear, on the basis of preliminary investigations, to be satisfactory for present conditions. In most cases, however, no special surveys have been made or hearings held as required by California law to determine legally whether "pollution" or "nuisance" is existing or threatened.

TABLE 3

AREAL DISTRIBUTION OF THE NORTHWESTERN LAHONTAN BASIN

State	Area in Square Miles	% of Total Area
California 1/	5,895	17
Nevada 2/	29,235	82
Oregon 3/	346	1
Total	35,476	100

1/ Percentage of total area of eight counties in Basin: Alpine 62%; Lassen 41%; Mono 33%; Sierra 20%; Nevada 18%; Placer 16%; Modoc 15%; and El Dorado 12%.

2/ Percentage of total area of 11 counties in Basin: Douglas 100%; Lyon 100%; Ormsby 100%; Storey 100%; Washoe 100%; Churchill 99%; Mineral 77%; Pershing 65%; Humboldt 65%; Lander 28%; and Nye 1%.

3/ Contains 4% of Lake County.

TABLE 4

Climatological Summary for Selected Stations Within the Lake Tahoe-Truckee-Carson Rivers Basin and the Walker River Basin. (Taken from "Climate and Man," 1941 Yearbook of Agriculture, U. S. Department of Agriculture, and publications of the Weather Bureau, U. S. Department of Commerce.)

Station	Elev.	Temperature, °F.				Frost	Precipitation (inches)	
		Jan. Avg.	July Avg.	Max.	Min.	Growing Season (days)	Period of Record	Annual Average
Nevada								
Fallon	3,965	29.8	73.1	106	-25	127	36	4.98
Lahontan	4,200	31.7	78.2	110	-17	158	32	4.54
Minden	4,730	32.2	69.3	109	-24	114	39	8.73
Fernley	4,150	34.1	73.7	106	-16	123	16	5.29
Smith	4,800	-	-	-	-	115	30	6.99
Yerington	4,375	30.3	70.5	105	-26	118	35	4.61
Schurz	4,124	31.3	73.4	109	-24	136	19	5.68
Thorne	4,200	34.3	77.3	109	-16	168	32	3.08
Carson City	4,675	32.4	68.6	107	-27	117	23	9.29
Lewers Ranch	5,200	33.9	67.8	102	-14	116	26	25.24
Marlette Lake	8,000	23.5	60.9	88	-18	-	17	27.28
Nixon	3,910	30.7	72.2	107	-24	137	11	5.55
Reno	4,532	32.5	71.0	106	-19	155	40	7.73
McDermitt	4,700	-	-	-	-	-	54	11.34
Gerlach	3,980	-	-	-	-	-	18	4.43
California								
Boca	5,535	-	-	-	-	-	48	20.55
Soda Springs	-	27.2	60.1	90	-28	68	8	45.64
Truckee	5,818	25.9	61.0	101	-28	59	27	26.13
Tahoe	6,230	26.3	60.6	94	-15	72	29	29.35
Markleeville	5,525	-	-	-	-	-	19	18.79
Shields Ranch	5,300	-	-	-	-	-	29	11.41
Bridgeport	6,440	-	-	-	-	-	20	10.14
Tallac	6,230	-	-	-	-	-	7	23.97
Fort Bidwell	4,735	-	-	-	-	-	20	17.69
Cedarville	4,675	-	-	-	-	-	37	12.43
Doyle	4,300	-	-	-	-	-	17	10.25
Susanville	4,271	-	-	-	-	-	45	20.05

TABLE 5
HYDROLOGIC DATA

(Data from "Surface Water Supplies of the United States, Part 10, Great Basin," Geological Survey, Dept. of the Interior)

Station	Location	Period of Record	Flow in Second-Feet & Date of Occurrence			
			Maximum	Minimum	Lowest Mean Flow	
					Monthly	7 Days
		TRUCKEE RIVER DRAINAGE				
TRUCKEE RIVER						
Near Truckee, Calif.	1.4 miles upstream Donner Creek. 2½ miles SW Truckee.	1944-49	1,110 2/2/45	11 1/27/48	70.6 Mar. '45	37.6 2/3-9/48
Reno, Nevada	½ mile east of Reno, 5 miles upstream from Steamboat Creek.	1947-49	1,840 2/12/47	50 9/21/49	97 Sept. '49	79.3 9/21-27/49
		1906-19	14,600 '07	18 7/2/12	111 Sept. '15	21.7 7/1-7/12
		CARSON RIVER DRAINAGE				
EAST FORK CARSON RIVER						
Near Gardnerville, Nevada	2 miles east Mud Lake Reservoir, 3 miles downstream Leviathan Cr., 7 miles SE Gardnerville.	1939-49	6,800 1/21/43	26 11/27/48	44.2 Sept. '47	37.7 9/5-11/39
WEST FORK CARSON RIVER						
Woodfords, Calif.	0.3 miles downstream from bridge on State Highway #8, 0.8 miles W. Woodfords, 3-3/4 miles downstream from Willow Creek.	1938-49	1,330 5/5/41	8.4 11/21/48	11.5 Sept. '47	10.7 9/24-31/47

CARSON RIVER						
Near Carson City, Nevada	2 miles downstream from Clear Creek, 5 miles SE Carson City.	1939-49	8,500 1/22/43	4 8/17/39	6.8 Aug. '39	5.4 8/13-19/39
Near Fort Churchill, Nevada	2 miles W. Fort Churchill, 6 miles E. of Cliffton.	1934-49	6,300 1/24/43	0 Nearly every yr. in Aug. & Sept. since 1934.	0	0
CLEAR CREEK						
Near Carson City, Nevada	3 miles upstream from mouth and 4 miles SW Carson City.	1948-49	23 5/6/48	1.0 8/4-6,20/49	1.22 Aug. '49	1.1 8/4-10/49
	WALKER RIVER DRAINAGE					
EAST WALKER RIVER						
Near Bridgeport, Calif.	1500' downstream from Bridgeport Reservoir, 5 miles N. Bridgeport, 10 miles upstream from Sweetwater Creek.	1921-49	1,240 1/22/43	1.8 11/20-24/44	3.31 Nov. '44	1.8 11/18-24/44
Above Strosnider ditch near Mason, Nevada	0.9 miles upstream from head of Strosnider ditch, 12 miles SE Mason, 13½ miles SE Yerington.	1947-49	246 5/28/47	3.1 3/21/48	8.8 March. '48	3.6 3/20-26/48
WEST WALKER RIVER						
Near Hudson, Nevada	½ mile upstream from Wilson Canyon, and 3 miles SE of Hudson.	1947-49	427 5/3/47	14 1/4/49	30 Jan. '49	30 1/1-31/49
EAST FORK OF WEST WALKER RIVER						
Near Bridgeport, Calif.	3/4 mile N. Sonora Junction, 1½ miles upstream from mouth, and 14 miles NW of Bridgeport.	1944-49	660 2/2/45	4.9 11/17/48	9.06 Oct. '48	7.8 11/14-20/48

TABLE 5 (Contd)

HYDROLOGIC DATA

Station	Location	Period of Record	Flow in Second-Feet & Date of Occurrence			
			Maximum	Minimum	Lowest Mean Flow	
					Monthly	7 Days
WALKER RIVER						
Near Wabuska		1903-04 1920-34	2,220 6/8/22		Prolonged zero flow periods, 1924, 1925, 1931.	
At Schurz, Nev.	3 miles above Walker Lake.	1913-33	2,530 6/8/14		No flow during periods in 1913, 1920, 1921, 1922, 1924, 1925, 1928.	
SUSAN RIVER						
At Susanville, Calif.	3/4 miles SW of Susanville.	1900-05 1913 1917-21	1,750 2/22/04	0.8 8/10/18	1.41 Aug. '20	1.0 8/3-24/20

TABLE 6

Irrigated Land in N.W. Lahontan Basin (5)

Watershed or Area	Acres Irrigated			
	Nevada	California	Oregon	Total
Cowhead and Warner Lake	700	500	1,000	2,200
Black Rock Desert	6,900	-	-	6,900
Quinn River	18,800	-	-	18,800
Surprise Valley	2,500	32,000	-	34,500
Smoke Creek	900	200	-	1,100
Truckee River	36,000	1,700	-	37,700
Steamboat & Washoe Valley	8,500	-	-	8,500
Pyramid Lake	2,900	-	-	2,900
Carson River (Upper)	35,000	8,100	-	43,100
Carson River (Lower)	54,300	-	-	54,300
Walker River	44,100	-	-	44,100
East Walker River	7,200	20,300	-	27,500
West Walker River	19,000	17,800	-	36,800
Walker Lake	3,700	-	-	3,700
Honey Lake	1,100	39,400	-	40,500
	241,600	120,000	1,000	362,600

TABLE 7

Principal Irrigation Storage Reservoirs (5)

River System	Reservoir	Capacity in Acre-feet	
Truckee	Lake Tahoe	732,000 *	
	Boca	41,000	
	Donner Lake	10,000	
	Independence	20,000	
			803,000
Carson	Lahontan	273,600	
			273,600
Walker	Topaz	59,000	
	Bridgeport	42,000	
	Weber	13,000	
			114,000
Susan	McCoy Flat	17,500	
	Hog Flat	10,000	
	Leavitt	12,100	
			39,600
			1,230,200

* Active storage capacity between water surface elevation of 6223 and 6229.1 feet, between which lake level fluctuations are permitted by agreement made in 1935.

TABLE 8

ANALYSIS OF WATER FROM SAWMILL POND (12)

Grab Sample	8-2-51
Determination	Results (Expressed as ppm except Acidity)
5 day B.O.D.	620
Oxygen Consumed	915
Tannin	5
Phenol	0.2
Acidity	5.48 meq. H+ per liter

TABLE 9

Bacteriological Quality of Water
Nevada Shore of Lake Tahoe

Year	No. of Samples	No. of Samples Showing Coliform MPN per 100 ml of 1/ -2.2	2.2	5.1	9.2	16.0	16.0+	Sampling Period	% of Samples Showing No. Coliform
1947	24	14	0	2	2	4	2	June 2 - August 27	58
1948	18	16	0	1	0	1	0	June 22 - September 9	89
1949	11	10	0	0	0	0	1	April 25 - October 11	91
1950	34	19	4	3	5	2	1	July 3 - September 22	56
1951	26	22	2	1	0	0	1	May 29 - August 7	85
1952	4	1	1	0	1	1	0	June 5 - June 13	25
Total	117	82	7	7	8	8	5	-	70

1/ Computed from examination of five standard 10 ml. portions Standard Methods for the Examination of Water and Sewage.

TABLE 10

BACTERIOLOGICAL QUALITY OF WATER (12)
COLIFORM COUNTS (MPN PER 100 ML)
CALIFORNIA SHORE OF LAKE TAHOE

Place	Date (1951)	No. Samples	No. of samples in range					% of samples showing no coliform
			4.5 or less	4.6-13	14-100	101-1000	1001-7000	
Brockway	7/27 - 8/8	35	14	8	13	0	0	24
Kings Beach	7/28 - 8/8	18	0	0	3	10	5	0
Tahoe Vista	7/25 - 8/8	35	5	2	18	8	2	14
Carnelian Bay	7/31 - 8/16	11	7	2	1*	1	0	64
Tahoe State Park	8/11 - 8/13	4	0	1	0	2	1	0
Tahoe Tavern	7/27 - 8/12	6	1	1	3	1	0	17
Tahoma Area	7/31	5	1	2	1	1	0	20
Meeks Bay	8/7 - 8/14	10	4	1**	5	0	0	50
Emerald Bay	8/7 - 8/13	9	1	1	3	4	0	11
Camp Richardson	8/7 - 8/14	3	1	0	2	0	0	33
Al Tahoe	8/7	3	0	2	1	0	0	0
Bijou-Stateline	8/7 - 8/9	14	5	7	2	0	0	21
	TOTALS	153	39	27	52	27	8	24

* One sample recorded as -23.

** One sample recorded as -6.0.

TABLE 11

RESULTS OF BACTERIOLOGICAL AND DISSOLVED OXYGEN TESTS - TRUCKEE RIVER CALIFORNIA (12)

STATION *	Most Probable Number Coliform Organisms per milliliter				Dissolved Oxygen	
	7-24-51	7-25-51	7-30-51	8-1-51	ppm	% Saturation**
			LAKE TAHOE TO TRUCKEE			
1	0.62		0.15	0.62	7.5	105
2	0.23		2.4	-		
3	13		0.38	0.62		
4	0.27		0.38	1.3	7.5	105
5	0.088		0.38	0.23	7.5	105
6	0.12		0.38	-		
7	2.4		0.15	0.23	7.4	103.5
7A	0		2.4	0.62		
8	0.022		0.38	0.5	7.4	103.5
9	0.38		> 2.4	2.1		
10	0.05		2.4	0.23		
11		0.62	0.38	0.23		
12		0.62	2.4	-	7.6	106.2
13		0.62	0.38	0.23		
14		9.5	0.23	2.30		

STATION *	7-25-51	7-30-51	8-3-51	ppm	% Saturation***
		VICINITY OF TRUCKEE			
15	0.38	2.4	0.13	7.5	104
S.P.R.R. Yd Discharge	> 70	-	> 70		
17	2.4	2.4	0.62		
18	0.05	0.38	2.3	7.5	104
19	0.05	2.4	-		
		TRUCKEE TO NEVADA STATE LINE			
20	0.088	0.38	0.23		
21	0.15	2.4	0.62		
22	0.62	0.38	2.3		
23	-	2.4	0.23		
24	-	-	0.62		
25	0.05	-	-		

---

* Station locations shown on following page.

** % Saturation corrected for altitude. Tests made 8-1-51.

*** % Saturation corrected for altitude. Tests made 8-3-51.

TABLE 11 (Contd)

STATION	Location	Highway Station Marker
1	Truckee River at Tahoe City Bridge	11+00
2	River, 1,300 feet below Tahoe City Bridge	24+00
3	River at Scates Stables	39+04
4	River, 3,000 feet below Scates Stables	67+18
5	Truckee River at Deer Park Bridge	176+14
6	River, immediately above Deer Park Lodge	205+71
7	River, immediately below Deer Park Lodge	210+65
7A	River, at undeveloped campsite	244+00
8	River, at Mrs. Walker's Bridge	273+50
9	Squaw Creek, at State Highway 89	309+62
10	River, 3,000 feet below Squaw Creek	338+48
11	River, at private bridge	441+13
12	River, at Edgewater Cabins	546+56
13	River, at undeveloped campsite	664+00
14	Donner Creek, at State Highway 89	
15	River, at Southern Pacific Railroad water intake	
16	Discharge from Southern Pacific Railroad yard	
17	River, at Truckee Sanitary District sewer line crossing	
18	River, opposite Truckee Sanitary District sewage disposal plant	
19	River, 1,500 feet below Truckee Sanitary District sewage disposal plant	
20	River, 1.5 miles below State Agricultural checking station	
21	River, at U. S. Forest Service Camp near Boca	
22	River, at U. S. Highway 40 bridge at Hirshdale	
23	River, below Floriston	
24	River, below Farad	
25	River, 2 miles above California-Nevada state line	

TABLE 12

RESULTS OF BACTERIOLOGICAL, DISSOLVED OXYGEN AND TURBIDITY TESTS
NEVADA

Station *	Approx. Elev. (Feet)	6/10 - 11/52 6/ D.O. ppm	Temp. oC 2/	% Saturation (Oxygen) 3/	Coliform MPN/100 ml.	8/25 - 26 - 27/52 7/ D.O. 2/ ppm	Temp oC	% Saturation (Oxygen) 3/	Coliform MPN 1/	Turbidity ppm 4/
						Truckee River				
1	4600	9.2	8	91	23 1/	8.5	10	88	>700	<7
2	4500	9.2	10	96	700	8.8	12	100	>700	10
3	4500	9.5	10	99	700	9.0	14	102	>700	20
4	4400	-	-	-	240	6.2	14	70	>700	20
5	4200	-	-	-	>700	9.0	18	109	700	15
6	3900	7.7	16	92	700	9.2	22	119	240	15
						Carson River System				
1	4700	8.3	11	88	240	7.0	13	78	>700	-
2	4800	-	-	-	-	8.7	12	96	700	<10
3	4300	0	13	-	700	8.0	20	101	240	-
4	4100	-	20	-	700	7.0	19	86	62	<10
						Walker River System				
1	4800	8.3	14	94	>700	7.6	16	90	700	20
2	4600	7.1	16	85	>700	8.2	17	99	700	75
3	4500	1.7 5/	15	20 5/	700	7.0	19	88	700	180

* See following page for station locations and footnotes.

TABLE 12 (Contd)

STATION LOCATION

Truckee River

1. Reno waterworks intake U.S. Highway 40.
2. Asylum Bridge.
3. Glendale Bridge.
4. First RR bridge east of Sparks.
5. Highway bridge at Wadsworth.
6. At Nixon municipal well.

Carson River System

1. Highway bridge (U.S. 395) near Genoa.
2. E. Fk. of Walker.
3. Bridge at Dayton near dam 5 miles S. of Gardnerville.
4. Highway bridge (U.S. 95 Alt) near Weeks.

Walker River System

1. W. Walker, Highway (Nev. 3) bridge near Wellington.
2. E. Walker Highway (Nev. 3) bridge south of Yerington.
3. Highway bridge (U.S. 95 Alt.) at Yerington.

FOOTNOTES

1/ Confirmed on B.G.B.
2/ Winkler method.
3/ Corrected for elevation above sea-level.
4/ Precision Scientific Co., immersion type turbidimeter.
5/ River extremely turbid. Probably incorrect.
6/ Represent flood conditions.
7/ Represent low-flow conditions. (Not extreme low flow.)

TABLE 13

WATER ANALYSIS - WALKER RIVER, NEVADA 1/

Sampling Point	No. of Samples		Ecx10^6	Ca+Mg+ EPM	Na+K (EPM)	SO_4 EPM	Cl EPM	HCO_3 EPM	CO_3 EPM	Na %
Wilson Canyon 2/	35	High	711	3.28	4.23	2.10	1.10	4.25	0.80	59
		Low	150	0.92	0.26	0.02	0.05	1.03	0.20	16
		Avg.	340	1.98	1.46	0.60	0.45	2.44	0.50	39
Hoye Canyon 3/	33	High	861	2.76	5.85	2.71	2.40	3.90	0.30	67
		Low	102	0.68	0.04	0.01	0.05	0.90	0.20	4
		Avg.	264	1.48	1.21	0.54	0.47	1.76	0.22	35
Strosnider Gauge 4/	34	High	441	2.72	1.73	1.16	0.63	3.15	-	41
		Low	139	1.32	0.20	0.01	0.10	1.24	-	7
		Avg.	298	2.07	0.97	0.42	0.42	2.33	-	28
Julian Ranch 5/	34	High	789	4.00	3.93	3.24	2.15	4.45	0.60	49
		Low	230	1.36	1.01	0.06	0.05	1.69	0.20	9
		Avg.	512	2.96	2.13	1.10	0.73	3.28	0.48	40

1/ U.S. Dept. of Agriculture, Soil Conservation Service, Reno, Nevada.

2/ West Walker River - Wilson Canyon "Bulkhead" Gauge.

3/ West Walker River - Hoye Canyon "Field Plus Outlet" Gauge.

4/ East Walker River - "Strosnider" Gauge.

5/ Walker River - Julian Ranch "Parker" Gauge.

TABLE 14

WASHOE PROJECT
CHEMICAL ANALYSIS OF WATER SAMPLES

U. S. Dept. of the Interior, Bureau of Reclamation, Carson City, Nevada
Carson River Below Lahontan Reservoir

Date Sample Collected	$Kx10^6$ @ 25° C	Suspended Solids ppm	Total Dissolved Salts ppm	pH	% Sodium	Equivalents per million						
						Cations				Anions		
						Ca	Mg	Na	Boron ppm	HCO_3	SO_4	Cl
8-14-47	301	62	256	7.8	37.9	1.35	0.55	1.11	-	1.79	0.89	0.29
11-17-47	226	5.1	131	7.3	40.8	0.77	0.52	0.89	-	1.68	0.27	0.37
4-6-48	277	17	164	7.5	49.4	0.94	0.42	1.33	-	1.86	0.53	0.57
11-16-48	254	26	165	7.3	38.4	0.95	0.48	0.89	0.32	1.60	0.58	0.40
3-22-49	292	< 10	216	7.1	43.9	0.98	0.62	1.25	0.50	1.76	0.71	0.55
7-15-49	274	30	182	8.5	41.1	0.94	0.61	1.08	0.32	1.57	0.77	0.38
11-16-49	360	< 25	256	7.4	47.0	0.92	0.77	1.72	0.59	2.18	0.86	0.62
3-15-50	201	< 25	139	8.0	-	0.66	0.41	-	0.49	1.21	0.31	0.35
7-17-50	275	< 25	194	8.1	30.3	1.08	0.55	0.80	0.33	1.40	0.76	0.35
11-20-50	83.7	225	91	8.1	36.2	0.28	0.21	0.30	-	0.45	0.38	0.0
Lahontan Reservoir Surface (Carson and Truckee River Water)												
9-29-47	306	40	227	7.6	35.6	1.41	0.67	1.15	-	2.22	1.08	0.32
11-17-47	293	85	207	7.6	38.6	1.24	0.64	1.18	-	2.14	0.80	0.34
4-6-48	254	18	160	7.6	40.6	0.98	0.62	1.09	-	1.75	0.50	0.45
11-16-49	330	36	244	8.1	43.2	1.17	0.74	1.50	0.35	1.95	1.07	0.45

TABLE 15

WATER ANALYSIS FROM NEVADA CITIES AND TOWNS, NORTHWESTERN LAHONTAN BASIN

From: "Chemical Analysis of Municipal Water Supplies, Bottled Mineral Waters, and Hot Springs of Nevada." University of Nevada, Reno, 1944.

(All values in parts per million)

Place	Total Solids	Silica	Iron & Al.	Ca.	Mg.	Na. & K	Carbonates	Bicarbonates	Sulphates	Chlorides	Hardness*	Alkalinity
Carson City (Spring)	87	10	Tr.	18	5	2	0	74	Tr.	9	65.5	60.7
Carson Indian School (Spring)	153	19	0.2	36	Tr.	20	0	144	Tr.	11	118.0	90.0
Dayton (Well)	147	18	Tr.	19	Tr.	47	0	56	52	35	45.9	47.5
Fernley (Well)	415	18	Tr.	78	18	54	0	305	115	12	250.1	268.8
Gardnerville (Well)	225	27	Tr.	37	4	31	0	183	24	6	108.9	150.6
Hawthorne (Spring)	298	43	Tr.	63	21	18	Tr.	232	54	23	221.5	190.2
Hawthorne (Well)	803	35	Tr.	132	36	67	0	122	366	65	100.0	477.6
Hawthorne (NAD) (Well)	268	23	Tr.	50	14	33	0	134	53	64	109.8	182.4
Minden (Well)	144	26	Tr.	24	2	23	0	88	22	5	60.0	72.1
Reno (Hunter Creek)	118	33	0.3	19	3	5	0	34	40	2	59.8	27.8
Reno (Truckee River)	84	21	0.8	13	4	3	0	52	11	3	48.9	42.6
Reno (4th St. Well)	300	37	Tr.	60	18	6	0	181	67	12	223.8	148.4
Reno (S. Virginia St. Well)	649	52	Tr.	40	13	151	0	200	225	35	153.3	164.0

* As $CaCO_3$

Reno (Crystal Spring)	198	16	Tr.	37	11	9	0	144	77	10	137.6	116.4
Reno (Diamond Spring)	225	18	Tr.	47	11	7	0	146	46	7	162.6	119.7
Reno (Sparkling Spring)	278	19	Tr.	50	14	25	0	210	65	5	182.4	172.2
Reno (High School Well)	232	31	Tr.	50	15	5	0	169	34	10	182.4	138.6
Schurz (Well)	310	63	Tr.	48	13	22	0	134	74	25	109.8	163.3
Wadsworth (Well)	300	43	Tr.	60	18	8	0	205	36	25	202.8	168.1
Yerington (Well)	145	22	Tr.	27	8	11	0	102	21	14	83.6	120.3
Virginia City (Marlette Lake)	86	18	Tr.	10	Tr.	8	0	49	Tr.	2	40.1	25.0
Hot Springs												
Bowers Mansion	194	39	Tr.	7	0.7	54	27	29	37	8	-	-
Carson Hot Spring	326	44	Tr.	6	2	104	27	47	84	34	-	-
Hot Spring near Pyramid Lake	5170	147	Tr.	272	5	1661	0	78	255	2693	-	-
Reno Hot Spring	2350	252	Tr.	28	8	832	0	373	125	1044	-	-
Steamboat Hot Spr.	2557	332	Tr.	30	9	790	0	293	237	950	-	-
Walley Hot Spring	480	55	Tr.	12	Tr.	141	19	146	94	42	-	-

* As $CaCO_3$

TABLE 16

Summary of Public Water Supply Information for Communities In the Northwestern Lahontan Basin

Community	Source of Supply	Treatment	1950 Population
		California	
Bridgeport	Wells	None	250
Markleeville	Hot Springs Creek	None	65
Sierra Ordnance Depot	Wells	Chlorination	6,000
Susanville	Springs	None	5,300
Truckee	Springs and wells	None	1,250
		Nevada	
Babbitt	Surface and well	Protected watershed Chlorination	3,000
Carson City	Springs	Chlorination	3,069
Fallon	Wells	None	2,393
Fernley	No community system	-	566
Gardnerville	Wells	None	629
Hawthorne	Surface and well	Protected watershed Chlorination	1,600
Minden	Well	None	220
Nixon	Well	Chlorination	200
Reno	Truckee River	Coagulation, Sedimentation, Chlorination	32,378
	Wells	Chlorination	
Sparks	(Water from Reno System)	Chlorination	8,170
Stewart	Deep well (Secondary supply from Clear Creek)	Coagulation, pressure filter, Chlorination	500
Verdi	No community system	-	250
Virginia City	Marlette Lake	Chlorination	561
Yerington	Well	None	1,182

Appendix B

RESOLUTION 52-3

LAHONTAN REGIONAL WATER POLLUTION CONTROL BOARD

Establishing Water Uses of Lake Tahoe-Truckee River Watershed

WHEREAS the Lahontan Regional Water Pollution Control Board has reviewed and accepted the report made by the State Department of Public Health entitled "A Study of Sewage and Industrial Waste Disposal Practices in the Lake Tahoe-Truckee River Region of California;" and

WHEREAS the report indicates that the area in question is one of the highly developed and used recreational areas within this region; and

WHEREAS the water from the lake and river is used for domestic supplies, swimming, boating, fishing, irrigation; and

WHEREAS the development and use of the area around the periphery of the lake and along the entire stretch of the Truckee River varies from very little or no development to highly populated or heavily developed areas; and

WHEREAS a portion of the lake is within the boundaries of the State of Nevada, and water from that portion in Nevada co-mingles with water from that portion in California; and

WHEREAS the State of Nevada has enacted legislation which authorizes the Nevada State Health Department to adopt, amend, promulgate, and enforce reasonable rules and regulations governing sewage disposal and domestic water supplies in the Lake Tahoe watershed; and

WHEREAS the State of Nevada has forbidden the direct discharges of sewage or industrial wastes, treated or untreated, into any surface waters of the watersheds of Lake Tahoe and the Truckee River within the State of Nevada; and

WHEREAS the State of Nevada is the ultimate recipients of a portion of these waters for domestic and irrigation purposes; and

WHEREAS the waters of Lake Tahoe and the Truckee River are used for domestic purposes without treatment; and

WHEREAS the Lahontan Regional Board is empowered by provisions of the Water Code of the State of California to protect the quality of the surface waters of the State for the above mentioned purposes: Now Therefore be it

RESOLVED, That it is the objective and policy of the Lahontan Regional Water Pollution Control Board to maintain the waters of the Lake Tahoe and Truckee River watersheds of a quality satisfactory for beneficial uses in the following order of significance:

1. Domestic
2. Swimming
3. Boating
4. Fishing
5. Irrigation;

and be it

RESOLVED further, that the following conditions shall be maintained in all the surface waters of the Lake Tahoe and Truckee River watersheds:

1. No sewage or industrial waste shall be discharged into the surface waters of the Lake Tahoe and Truckee River watersheds, that does not meet the U. S. Public Health Service Standards for Drinking Water at all times.

2. The dissolved oxygen content of these waters shall not be less than 5.0 ppm.

3. There shall be no floating materials or solids in these waters attributable to sewage or industrial waste origin.

4. The sewage or industrial waste discharges will not create odors or coloration of the waters.

These uses and order of importance may be changed by the Board from time to time when in the interest of water pollution control.

Passed and adopted by the Lahontan Regional Water Pollution Control Board No. 6 on September 25, 1952, at a regular meeting of said Board by the following votes:

Appendix C

(From "Public Health Service Drinking Water Standards 1946")

3.2. Application. Applications 3.21 and 3.22 given below shall govern when ten milliliter (10 ml.) portions are used and applications 3.23 and 3.24 shall govern when one hundred milliliter (100 ml.) portions are used. [5]

3.21. Of all the standard ten milliliter (10 ml.) portions examined per month in accordance with the specified procedure, not more than ten (10) percent shall show the presence of organisms of the coliform group.

3.22. Occasionally three (3) or more of the five (5) equal ten milliliter (10 ml.) portions constituting a single standard sample may show the presence of organisms of the coliform group, provided that this shall not be allowable if it occurs in consecutive samples or in more than:

(a) Five (5) percent of the standard samples when twenty (20) or more samples have been examined per month.

(b) One (1) standard sample when less than twenty (20) samples have been examined per month.

Provided further that when three or more of the five equal ten milliliter (10 ml.) portions constituting a single standard sample show the presence of organisms of the coliform group, daily samples from the same sampling point shall be collected promptly and examined until the results obtained from at least two consecutive samples show the water to be of satisfactory quality. [6]

3.23. Of all the standard one hundred milliliter (100 ml.) portions examined per month in accordance with the specified procedure, not more than sixty (60) percent shall show the presence of organisms of the coliform group.

3.24. Occasionally all of the five (5) equal one hundred milliliter (100 ml.) portions constituting a single standard sample may show the presence of organisms of the coliform group, provided that this shall not be allowable if it occurs in consecutive samples or in more than:

---

[5] It is to be understood that in the examination of any water supply the series of samples for any one month must conform to both of the above requirements, either 3.21 and 3.22 or 3.23 and 3.24, respectively.

[6] When this occurs, and when waters of unknown quality are being examined, simultaneous tests should be made on multiple portions of a geometric series ranging from 10 ml. to 0.1 ml. or less.

(a) Twenty (20) percent of the standard samples when five (5) or more samples have been examined per month.

(b) One (1) standard sample when less than five (5) samples have been examined per month.

Provided further that when all five of the standard one hundred milliliter (100 ml.) portions constituting a single standard sample show the presence of organisms of the coliform group, daily samples from the same sampling point shall be collected promptly and examined until the results obtained from at least two consecutive samples show the water to be of satisfactory quality. 7/

3.25. The procedure given, using a standard sample composed of five standard portions, provides for an estimation of the most probable number of coliform bacteria present in the sample as set forth in the following tabulation:

Number of portions		Most probable number of coliform bacteria per 100 ml.	
Negative	Positive	When 5-10-ml. portions are examined	When 5-100 ml. portions are examined
5	0	Less than 2.2	Less than 0.22
4	1	2.2	.22
3	2	5.1	.51
2	3	9.2	.92
1	4	16.0	1.60
0	5	More than 16.0	More than 1.60

7/ When this occurs, and when waters of unknown quality are being examined, simultaneous tests should be made on multiple portions of a geometric series ranging from 100 ml. to 1.0 ml. or less.